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CLUES AND CRIME

BY THE SAME AUTHOR

GENIUS AND CRIMINAL

A Study in Rebellion

SOME PERSONS UNKNOWN

Being an Account of Scientific Detection



By permission of Dr. Ed. Locard.

PLASTER CAST OF THE FACE, HANDS AND WAISTCOAT OF
BURGLAR.

(Imprint found in a clay bank.)

CLUES AND CRIME

THE SCIENCE OF CRIMINAL INVESTIGATION

BY

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PREFACE

THE aim of this book is to give an historical account of the progress of the application of scientific methods to the detection of crime. It has been more or less popularly treated and includes descriptions of appropriate criminal cases. It is hoped that the book may be of interest not only to the general reader, for whom it is primarily intended, but to those who are technically interested in the application of scientific methods to criminal investigation.

As far as possible original sources have been consulted in the examples, but the author must express his acknowledgments to all the works quoted in the bibliography which appears at the end of this book. He would specify in particular Wills' *Circumstantial Evidence* and *Mysteries of Police and Crime* by Major Griffiths.

From the scientific point of view the author must acknowledge the great debt that he owes to Dr. Edmond Locard's *Traité de Criminalistique*. This is primarily a textbook and probably the most comprehensive work on the subject which has yet appeared in any language. No student of criminology can afford to be without it.

The photographs which illustrate this book not taken by the author are acknowledged *in situ*, and the author thanks those who have permitted him to reproduce them. His thanks are also due to Mr. A. T. K. Moir for the use of photographic apparatus.

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INTRODUCTORY

CHAPTER I

CRIME AND DETECTION : PAST AND PRESENT

THE twentieth century has not produced greater philosophers than Thomas Aquinas and Duns Scotus, a greater scientist and engineer than Leonardo da Vinci, a more brilliant physicist than Newton, or a more able experimental chemist than Boyle. Civilization advanced by reason of continued additions to the deposit of fact ; but this is advance in quantity which may or may not be accompanied by one in quality. The criterion of mentality cannot be determined alone by an appeal to our modern ability to assimilate and make use of facts. This is only a quantitative estimate. In this rapid and even feverish pursuit we have lost much of enduring value.

It is, however, by this quantitative criterion that the history of the detection of crime has to be judged. As a matter of fact, many of the methods employed in the detection of crime and properly called scientific to-day might have been applied to criminal investigation in the seventeenth century. It was not ignorance but different theories of the nature of proof which makes the seventeenth-century trial, and even some of those later in date, appear so extraordinary to us. In some systems of jurisprudence a confession has been regarded as a necessary part of the proof, and in England of the past it was thought to be, of all,

the strongest evidence of guilt. The theory is quite reasonable and there is much to be said for it, but in practice it led to terrible abuses. Every effort was made to induce the accused to confess, and torture was the recognized method of compelling the unwilling witness to speak. The same theory in a slightly different form was responsible for the barbarous practice of "pressing." The prisoner who refused to plead was condemned thus :

That you be taken to the prison whence you came, to a low dungeon into which no light can enter ; that you be laid on your back on the bare floor, with a cloth round your loins, but elsewhere naked ; that there be set upon your body a weight of iron as great as you can bear—and greater ; that you have no sustenance, save on the first day three morsels of the coarsest bread, on the second day three draughts of stagnant water from the pool nearest to the prison door, on the third day again three morsels of bread, and such water alternately from day to day until you die.

As late as 1721, William Spiggot, a highwayman, was pressed with a weight of 350 lb. for refusing to plead. When a further 50-lb. weight was added he consented to do so and was tried and convicted. In 1654 a Major Strangways, charged with murder, was actually pressed to death. The *peine forte et dure* as it was called remained upon the statute book until 1775.

It was assumed that a refusal to plead necessarily implied guilt, and that the obstinacy of the prisoner in refusing to do so justified this barbarous form of extorting confession from him if one had not already been made. A trial at that time could not proceed

if the accused stood mute. Since 1775 in the case of a refusal to plead a formal plea of not guilty is entered.

Detective methods at that time were therefore not considered necessary since the guardians of law and order concentrated rather upon making their prisoner confess than upon less direct evidence of guilt. Curiously enough, however, the Strangwayes crime was one of the early examples where an endeavour was made to collect circumstantial evidence systematically. There were many mysterious features about the affair. Mr. Fussel, the victim, against whom Major Strangwayes was known to bear a grudge, was sitting one evening in his lodgings above the George and Half Moon without Temple Bar. Between nine and ten o'clock two shots from a carbine were fired from the street through the window, one striking him in the forehead and one in the mouth. A third struck the wood of the window-frame. Mr. Fussel died without a groan, and not the least remarkable feature of the affair was the fact that the murdered man's clerk who was with him in the room seems not to have suspected what had happened. It was the prolonged silence of his master which first attracted his attention.

Major Strangwayes, against whom there was no direct evidence whatever, was arrested on suspicion, since he was known to be on bad terms with the murdered man, and committed to Newgate. He was brought into the presence of the corpse and made to take hold of one of the hands. It was believed at that time that the touch of the murderer caused the

wounds of his victim once more to bleed. The test failed, but despite this the accused was held.

Neither police nor detectives in any sense that the term is now understood existed at that time ; but the jury of the Coroner's Inquisition acted with promptitude and good sense. It was suggested that inquiries should be made of all the gunsmiths of London to ascertain if a carbine had been sold or lent out the day before the murder. A member of the jury, himself a gunsmith, overruled this as impracticable. This gunsmith, however, provided the clue. On being questioned by the foreman as to whether many carbines were sold and lent in London he said that he himself frequently lent and sold them, and that he had, in fact, lent one to a Major Thompson on the day before the murder. Officers were sent to apprehend Thompson. It was found that he had left for the country but his wife was arrested. When news of this reached the husband he returned and confessed that he had borrowed the carbine on behalf of Major Strangeways.

There seems to be no doubt that the jury desired to get possession of the carbine probably with a view to ascertaining if the shots found on the scene of the crime could have been fired from it. This is an elementary example of an attempted application of forensic ballistics.

Major Strangeways, however, on being confronted with the evidence given by Major Thompson, saved the jury further trouble by making a full confession.

The amazement of the prisoner at the perspicacity of the jury—in which he declared he saw the hand of

an outraged Providence—is a significant indication of how little even such elementary methods of detection as these were in use. In this inquiry the means adopted combined the contemporary superstitious uses, the brutalities of extorting a plea, and sound detective procedure upon which modern scientific methods are based. The test of the flow of blood was applied. The prisoner, although he had confessed, was pressed to death for refusal to plead, and a genuine attempt was made to collect circumstantial evidence against him. In fairness it must be pointed out that in regard to the infliction of the *peine forte et dure* the circumstances were unusual. Although the prisoner had confessed, since he had refused to plead he could not be tried, so that the procedure—in law and equity as they were understood at that time—was perfectly justifiable.

It might even be said of this affair that if the procedure was harsh and brutal, it was rough justice, since the guilt of the accused was beyond reasonable doubt.

However this may be, it remains true that until the end of the eighteenth century, and in some cases afterwards, judicial procedure in Europe endeavoured by every possible means to extort a confession from the accused. The extraordinary behaviour and point of view of Judge Cambo of Malta is almost inexplicable to us now. But it indicates the superstitious reverence in which proof by confession was held, as well as the illogical devotion to the letter of the law and the too literal interpretation of the proverb *Exceptio probat regulam*.

During the early part of the eighteenth century Judge Cambo occupied one of the principal judicial posts in the island of Malta. While dressing one morning his attention was attracted by a scuffle immediately beneath his window. Looking out, the judge observed an affray between two men, one of whom stabbed the other with a stiletto. Judge Cambo saw the face of the assailant clearly while he was making his escape. In escaping the assassin's cap fell off, but he returned for it and at the same time threw away the sheath of his weapon. The man then disappeared.

A baker next appeared on the scene and first seeing the sheath picked it up and put it in his pocket. On catching sight of the corpse he became terrified and took to his heels, fearing to be charged with the crime. All this the judge observed. A police patrol coming upon the scene and noticing the fugitive in the distance gave chase and arrested him. The baker was, of course, searched and the sheath found upon him. It was further noted that the stiletto blade which remained in the body fitted the sheath.

Judge Cambo, who had witnessed them and was accordingly aware of all the circumstances, presided at the trial of this baker whom he had made no attempt to protect. He quite sincerely held the view that as a judge he had no right to act upon his private knowledge and that he must try the case on the merits of its evidence as he would have tried any other.

The circumstantial evidence was not sufficient to warrant a conviction, but despite this the judge ordered that the Question Ordinary and Extraordinary

be applied to the baker to induce him to confess. Under torture the unfortunate wretch did in fact confess to the crime he had never committed. This was sufficient for the judge. His conscience was clear. The accused had been proved guilty by due process of law. Judge Cambo accordingly sentenced him to death.

By reason of a confession made by the real culprit the truth came out some time later. The judge's part in it also became known since the murderer had observed the judge at the window. An inquiry was instituted by the Grand Master of the Templars at which Judge Cambo hotly defended his attitude in the affair. The Grand Master, however, degraded him from his office.

This is an extreme case in illustration of the *reductio ad absurdum*, but it illustrates well enough the judicial attitude of the seventeenth and eighteenth centuries, and it certainly explains the absence of any serious attempt to establish proof of guilt by the help of indirect evidence of collateral circumstance.

Many of the methods employed later in the detection of crime were within the competence of investigators of the seventeenth century. The examination of poisons could not be carried out satisfactorily since chemistry as we understand it did not exist until the end of the seventeenth century, and toxicology not until much later ; but the microscope was known and its use well understood. There was no reason at all why clues such as textile fabrics should not have been identified in much the same way that they are now. Mensuration and the arts of measurement which

depend upon it had been greatly studied, so that to take a cast of a footprint and examine it would have presented no more difficulties at that time than at present. But to search for evidence of this kind at any seventeenth-century trial is to search in vain.

Poison was still regarded as being more or less associated with witchcraft, although long before its chemical detection was possible it was customary to make an autopsy when inflammatory and some other indications associated with the ingestion of toxic substances could sometimes be recognized.

A post-mortem examination was carried out on the body of the eldest D'Aubray, one of the victims of the Marchioness of Brinvilliers in 1670. The result was negative, the doctors attributing the death to "malignant humours." The result in the case of the second D'Aubray was, however, more successful. The medical men were unable to prove poisoning, but according to their report the lungs were ulcerated and the liver and heart burnt up. This is hardly satisfactory, but it does suggest that they came across some indications which were not consistent with death from natural causes.

The poisons in the strong box discovered among the effects of St. Croix, the principal accomplice of Brinvilliers, were also tested. The contents were found to consist of corrosive sublimate, roman vitriol, antimony, and powdered vitriol. There was further a bottle containing a colourless liquid with an insoluble white deposit at the bottom. Some of this was administered to a pigeon, a dog, and a cat. All the animals died, but upon opening them no trace of the poison was

found. The methods of testing the other poisons are not recorded, but it is not probable that they were very reliable, and the fact that no trace of the poison administered to the animals could be traced is evidence of the very elementary knowledge of the subject which prevailed at that time. The white powder was almost certainly arsenic.

From this example it is, however, clear that towards the latter part of the seventeenth century the importance of isolating the poison and if possible of identifying it was beginning to be recognized. But for many years afterwards this was not regarded as essential.

It was not held to be so in the case of Kitty Ogilvy, who was accused of murdering her husband by poisoning him with arsenic in 1765. This trial has been described by Burton as "a reproach to the jurisprudential science of Scotland," and there has probably never been another case in Great Britain in which the evidence was so defective or in which so much testimony was allowed which ought to have been excluded.

It is true that Thomas Ogilvy died suddenly in suspicious circumstances, but he had been ailing for some time and two of the medical men who examined the body found nothing sufficiently suspicious to suggest that death was due to other than natural causes. There was no autopsy, so that it was never proved that any poison had been administered, much less that the supposed victim had died of it. No poison was ever traced to Kitty Ogilvy. Other than the symptoms which preceded his death, there was nothing even to suggest that Thomas had been

poisoned. It was merely argued that the motive for the murder was Kitty's love for her brother-in-law, Patrick.

Both Kitty and Patrick Ogilvy were tried for the murder and convicted. Patrick was executed, but the girl escaped in disguise before the date fixed for her execution, March 17th, 1796. She reached Calais and disappeared, thus avoiding the consequences of a conviction that should never have been recorded.

Before the application of modern methods of criminal investigation, the solution of a mysterious crime was almost an impossibility. We depend to-day very much upon the indirect evidence of fingerprints, footprints, and the scientific examination of objects left on the scene of the crime and many other minutiae to establish the identity of the criminal or criminals. In the past there was a tendency to ignore all but direct evidence, and to endeavour, as we have seen, to extort confession. Fingerprints, of course, were not discovered until the end of the nineteenth century, and although from the earliest times footprints have been examined for the purpose of tracing the authors of a crime, exact measurements did not generally form part of the investigation. We shall consider later the strange evidence of the footprints in a murder case which indicates clearly that even as late as the beginning of the nineteenth century such matters were not as carefully studied as they are now.

Evidence relating to bloodstains, now so often absolutely vital in murder trials, was quite valueless until comparatively recently. Not all of it was so unsatisfactory as that given in the action for libel

arising out of the trial of Robert Green and his accomplices for the alleged murder of Sir Edmund Godfrey in 1679, but much of it was little better. In this affair one of the witnesses deposed that he had seen the place where Sir Edmund Godfrey had been discovered dead. He had seen some stains which he confidently asserted were those of blood, and a little farther away he had observed some "whitish" blood.

The witness, William Batson, replying to a question by the judge as to whether it was frosty, made this odd and very ambiguous reply :

"My Lord, I cannot tell whether it was, but I will assure you the blood looked to me more like blood that was laid there than anything else."

This was by no means the last occasion in which the evidence of eyewitnesses has been admitted in circumstances which made it very misleading. It is impossible to decide by a mere inspection if a stain is actually one of blood or not. Iron mould, stains from dyes, paint, and even simple grease stains have frequently been mistaken for those of blood.

Until the blood corpuscles were observed and methods of measuring them under the microscope discovered, no satisfactory evidence was ever available regarding a suspicious stain. Even in the middle of the nineteenth century testimony relating to the microscopical examination of blood was not accepted in courts of law, although at this time fresh blood could always be detected as such, and a stain of human origin distinguished from one of animal blood by the size of the corpuscles. Various biological and chemical tests then became available, and in 1850, provided

the stain was not too old, it would always have been possible to decide if it were blood or not.

Since that time advances have been made which will be described hereafter. It is now possible to distinguish human from animal blood ; often to decide its source, as to whether it is, for example, menstrual blood. In one case, to be considered later, the establishment of this fact or the contrary might have been of the first importance. It is now sometimes possible to decide if the blood could have belonged to a particular individual or not, and it has even been claimed recently that the individual origin of blood can in most cases be determined. If this could in fact be done, no murderer stained with the blood of his victim could escape condemnation once he was in the hands of the police.

From an historical as much as from a criminological point of view, the crime of forgery is one upon which the greatest issues have hung. Such malpractice is probably as ancient as handwriting itself. Resort has been had to it in the cause of religion and in support of judicial crimes, and it remains from any point of view an offence often attended with more serious social consequences even than murder.

Who shall say to what extent the history of England might have been changed had Mary Stewart, Queen of Scots, been in a position to command the services of a scientific graphologist ?

As Ainsworth Mitchell has pointed out, the matter of the " Casket Letters " and their authenticity must remain in doubt since the originals are not available. This correspondence was alleged to be love letters

written by Mary to Bothwell prior to Darnley's death. If these letters were, in fact, genuine it would have been a reasonable inference that the Queen of Scots was implicated in the murder of Darnley.

Maitland of Lethington, sometime secretary to Queen Mary, together with the Earl of Murray and George Buchanan, have been accused of forging them. The forgeries, if forgeries they were, were uttered by the Earl of Murray and put in as evidence against the Queen.

No indubitable original of any of this correspondence exists or it would now be possible to decide if this correspondence were genuine or forged, but at the time of the inquiry the actual documents must have been available. The Queen absolutely denied their authenticity, but the Commissioners in arriving at their decision had to decide upon hearsay evidence and vague indications of spelling, composition, and general form of the disputed writing. Nothing could have been more unsatisfactory, and the truth of the matter remains in doubt until this day.

Mary Queen of Scots was executed upon the evidence of twenty words contained in the postscript of one letter—" *I would be glad to know the names and qualities of the six gentlemen which are to accomplish the designment.*"

The original was never produced, a circumstance which might be suspicious in itself, and Mary contended that these words had never been added to the letter by her, nor by her authority. She argued, indeed, either that one of her secretaries had added the postscript, or that it was a forgery for which Sir

Francis Walsingham, the Secretary of State, was responsible. Both Lord Burghley and Walsingham were able but thoroughly unscrupulous statesmen, and this may well have been true. However this may be, a modern graphologist in possession of the original document would probably have given a decision placing the matter beyond a doubt in one direction or another. As it was, the verdict was dubious and has remained so until now. Even Elizabeth, greatest and most courageous of English monarchs, if no less unscrupulous than her ministers, hesitated to sign the death-warrant and endeavoured, too late, to recall it. Mary Stewart was in any case condemned upon defective evidence. Her execution was a judicial murder.

In no direction has the technique of detection advanced so slowly as in the case of forgery. We are disposed to consider the evidence in the trial of Mary Stewart quite inadequate, but in the matter of deciding the genuineness or otherwise of a document, the difficulties were hardly less two or even three hundred years later.

It is not the rule, however, even in early forgery trials to rely merely upon direct evidence. Dr. Dodd was tried in 1777 for forging and uttering a promissory note which purported to bear the signature of Lord Chesterfield. The forgery was discovered owing to the perspicacity of the solicitor of the lender. He noted certain blots which he judged had been made deliberately, and although he had no reason to doubt the authenticity of the note these blots aroused suspicion. When inquiry was made, Lord Chesterfield repudiated

the document. Dr. Dodd made no attempt to defend himself, but offered to refund the amount, and he did in fact repay at once £3,900 out of the 4,000 guineas. In spite of this he was convicted and executed, the King, George III, having refused to pardon him.

In the famous Perreau trial to be considered later it appeared that Mrs. Rudd, who was admitted as king's evidence, was very skilful with her pen, and specimens of her handwriting were produced and put in as evidence. Mrs. Rudd was afterwards tried, a proceeding which was made the matter of a legal argument, and acquitted. The whole proceeding was very irregular since if she were a principal she should not have been admitted as king's evidence, but having been so admitted she should not have been tried. In any case, however, the grudging acquittal recorded by the jury indicates either that she was an exceptionally clever forger, or that the examination of the suspected material was not sufficiently conclusive. There is no doubt at all that Caroline Rudd was guilty and probably the prime mover in the affair. Nor is there much question that modern methods of investigation would have established her guilt conclusively. It is a curious fact that it was this trial, as a result of which both the Perreaus were executed, which accounts for George III's refusal of clemency in the case of Dr. Dodd. The King said that if he were pardoned it would be argued that the Perreaus were murdered.

An examination of the examples quoted and others at contemporary periods suggests that the whole matter of criminal investigation and the examination of the accused falls roughly into three periods. In

medieval times and more or less down to the end of the sixteenth century torture was used as a matter of course to extract, if possible, a confession from the accused, or to cause witnesses who might or might not be implicated to give evidence likely to be of assistance to the prosecution. This is not to say that voluntary evidence and circumstantial evidence were entirely neglected, but they were not regarded as essential. In any case, circumstantial evidence as it is now understood did not figure largely in medieval jurisprudence.

This must be qualified. The evidence obtained by ordeal might properly be described as circumstantial. Most of it was founded upon superstitious beliefs as to the conclusions which could properly be drawn from such circumstances, but not all. There is, for example, the curious legend of Macaire and the dog Montargis. Macaire was accused of the murder of Aubry de Montdidier in 1391, during the reign of Charles V of France. The fierce behaviour of the dog when confronted by Macaire was the circumstance which aroused suspicion. The court accordingly directed that there should be an ordeal by battle between the suspect and the dog, Macaire being armed with a shield and staff. The dog was victorious.

Here is an example of what we should now regard as superstition combined with common sense. It might have been a suspicious circumstance that the murdered man's dog hated Macaire, and it was legitimate to take such circumstantial evidence into consideration. The case of Wainwright, the Whitechapel murderer, provides a more recent instance of how the

behaviour of a dog had a bearing upon the discovery of the crime. An ordeal by battle, however, is not a method of arriving at a verdict which would appeal to us now.

In the second period covered by the seventeenth century, torture while it had not disappeared was beginning to fall into disfavour. There was an increasing tendency to collect evidence and for it to be given voluntarily. Traces of medico-legal science begin to appear. The affairs of the Marquise of Brinvilliers and Major Strangways are fairly typical examples. But it must be noted that torture was probably used or certainly threatened to make Brinvilliers speak, and that in the Strangways murder the test of the suspect's touch was applied.

In the third period of the eighteenth century and onwards torture, except for the *peine forte et dure*, had practically disappeared. Many brutalities remained, but, with the exceptions quoted, they formed no recognized part of the legal machinery. And almost contemporaneously the era of scientific detection began. That is to say that the importance of scientific method was recognized and applied. The technique was necessarily elementary, but it more commonly formed a part of the procedure of detection than has been supposed.

Scientific method does not ultimately depend upon technique, but upon the habit of mind which is brought to bear upon any inquiry. That is the difference between the medieval and modern jurist in their view regarding the utility of different kinds of evidence. The earlier jurists, no less acute than those of to-day,

left a great deal more to Providence and indeed assumed as a matter of fact that the direct intervention of Providence was something that it was necessary to take into account in the administration of law. The eighteenth century, more sceptical, was, for this very reason, more just.

Traces of the ancient methods survived, however, even as late as the nineteenth century. In 1817 an *Appeal of Murder* was brought against Abraham Thornton by William Ashford, brother of Mary Ashford, for whose murder Thornton had been tried and acquitted. Thornton pleaded, "Not guilty, and I am ready to defend the same with my body."

This was bringing into operation the old law, not then repealed, of trial by combat.

The accused threw down a glove in court, which the appellant was dissuaded from picking up since he was weakly.

A long legal argument followed and the plea of *Wager of Battel* was allowed, the learned judges ruling that the Wager must be accepted if the *Appeal of Murder* were to stand. In announcing the ruling Lord Ellenborough remarked that it was their duty to pronounce the law as it was, not as they might wish it to be. Its administrators were more enlightened than the law, but as a result of this incident both the *Appeal of Murder* and the *Wager of Battel* were repealed.

The twentieth century has seen a great increase in the application of circumstantial evidence to the detection of crime. This is not merely because circumstantial evidence is regarded with greater favour than

formerly, but rather by reason of the improved facilities which science has made available in assessing its value. In the matter of evidence relating to blood-stains, it is obviously of greater value if it can be shown indubitably in a case of murder that the blood is human blood. The method of deciding, in a suspected poisoning, that the matter ingested is toxic by administering it to an animal is less conclusive than a chemical analysis in which the poison is actually detected and its quantity estimated.

Where forgery is concerned, it is remarkable that before the development of scientific methods conviction for certain kinds of forgery were ever recorded at all. When handwritten documents or signatures were involved, the evidence must necessarily have been defective. It was customary to accept evidence of those who knew the handwriting in question well and were therefore supposed to be able to judge as to its genuineness or the reverse. The uncomfortable suspicion must thus always remain that false signatures may not infrequently have been pronounced genuine and some genuine pronounced to be false. Evidence in regard to forgery of this type is nearly always circumstantial so that only a scientific demonstration will really carry conviction. In the seventeenth and eighteenth centuries nothing of the kind was ever attempted, and in the nineteenth century examples are rare. Enlarged photographs, however, were used to investigate the Pigott forgeries. These made the fraudulent manipulation quite evident, but curiously enough the photographs were not produced in court.

The slow development of scientific methods applic-

able to the examination of handwriting largely accounts for an unpopularity which persists until this day. There is no type of expert evidence which is more open to quackery, and none in connexion with which so much has been practised—a fact which probably accounts for the great caution with which testimony concerning handwriting is regarded in courts of law. An attempt will later be made to indicate the difference between genuine scientific evidence and so-called expert opinion in graphology.

This review has at least made it fairly obvious that methods of criminal investigation have a history and that their evolution is capable to some extent of being identified and defined. It is also evidence that different views as to the nature of admissible evidence have had a profound effect upon the development of detective methods. Bearing these facts in mind, we shall in subsequent chapters endeavour to trace the evolution of scientific methods employed to trace the criminal, and to bring his crime home to him when he has been traced.

CHAPTER II

CLUES : YESTERDAY AND TO-DAY

THE Oxford Dictionary tells us that a clue is a "fact or principle that serves as a guide or suggests a line of inquiry."

This is a very clear definition provided there is an understanding as to what is meant by facts and principles in criminal investigation. D. B. Wyndham Lewis has told us in his book on the criminal poet, Villon, that after the burglary in the College of Navarre carried out by Villon and his accomplices, the Prior of Perray was responsible for unearthing the first clue where the police of Paris had failed. Quite by chance he fell in with one of the robbers named Guy Tabarie. He was not a principal and had, as it were, merely held the tools ; but, all the same, he had full and guilty knowledge of the adventure. The Prior's method had been to make Tabarie drunk and extract information from the unguarded torrent of his loquacity. It proved very useful, and when reported to the authorities resulted in the arrest of some of the principals in the affair. But it is significant that this clue did not come to light until twelve months after the commission of the robbery, and that it was more or less by accident that it came to light at all.

This is not the only important aspect of the business.

The clue in this case was, after all, the statement of a drunken man. *In vino veritas* does not necessarily mean that those in their cups always tell the truth, and for anything the Prior of Perray knew Guy Tabarie, drinking by his invitation more than was good for him, might have been lying as well as boasting when he claimed a close acquaintance with the master criminals of the Coquillard.

There is significance in this of interest from an historical point of view. Information of this kind would to-day hardly be said to amount to a clue at all. This is not to say that a modern police investigation never considers such scraps of information as a man in his cups might supply, but such evidence is not now regarded from at all the same point of view as it was at a time when it would have formed a normal and often essential part of a criminal inquiry. In fine, deliberately to make a potential witness or informer drunk for the purpose of extracting information from him, and then to squeeze him dry by means of a thumb-screw was then regarded as quite sufficient to set moving the machinery of justice.

The affair of the Lady Mazel at the end of the seventeenth century illustrates very clearly the values attached to different kinds of evidence at that time. Her murdered body was discovered by her butler, Le Brun, at about eight o'clock in the morning. A savage attack had been made upon her with a knife and some fifty wounds were found on her body. Her hands were also cut, indicating that she had struggled. A knife was found in the ashes of the fire, among the bedclothes was a piece of lace and a napkin folded in

the form of a nightcap. The motive was never established since nothing of great value was missing.

The knife, the nightcap, and the piece of lace might have proved valuable clues, but no satisfactory use of them was made in clearing up the mystery. Le Brun was strongly suspected, and part of the evidence advanced against him was the fact that the folded nightcap fitted his head. Neither the lace nor the knife was shown to be his. Later a bloodstained shirt was found in a loft. This did not fit Le Brun.

The butler was tried for complicity in the murder, and it was not suggested that he had actually committed it. It was assumed that he had an accomplice in the house who had escaped after committing the crime. The only evidence against him of the least value was the admittedly suspicious fact that he had master keys, and that the doors showed no signs of a forcible entry having been effected.

Le Brun was tortured on the rack and the Question Extraordinary was applied. He died under torture, protesting his innocence to the last.

Here the vital distinction between ancient and modern criminal investigation stands out very clearly. Le Brun was in this case assumed to hold the clue, and he was tortured with a view to extracting it from him. No use appears to have been made of the material evidence of the nightcap, the knife, and the piece of lace, and it probably would not have occurred to the investigators that an examination and an inquiry concerning these might have been of greater use than an attempt—ultimately to prove abortive—to extract evidence from an unwilling wit-

ness under duress of torture from the effects of which he died.

The investigators in fact relied upon the statement they hoped to extract from the suspected man. The independent line of investigation which the objects found on the scene of the crime might have suggested was not followed up.

There seems to be no evidence that the arrest of a horse-dealer named Berry was due to suspicion that he had anything to do with the murder of Lady Mazel. Suspicion fell upon him afterwards because in his possession there was found a watch known to have been the property of the dead lady. Berry was accordingly tortured as Le Brun had been, and on the rack he confessed to having committed the murder. He did not in his confession involve Le Brun and although certain facts tended to show that this valet had been implicated, the evidence was very slender, and it is not impossible that this unfortunate man was entirely innocent.

We observe in this example the failure, common at that time, to appreciate the utility of material evidence and to follow up what would now be regarded as a significant series of clues. It is yet another illustration of the point of view which supposed that the statement of the suspect or the actual criminal was the only evidence worth having.

But it would be unfair to suggest that circumstantial evidence as it is now understood found no place in the primitive technique of criminal investigation. There is, after all, a type of crime where no other line of inquiry is open. In early times this

generally meant that in such circumstances the mystery remained unsolved, or that there was a miscarriage of justice. To refer back for a moment to the Lady Mazel affair by way of example, there was an attempt made to connect Le Brun with the crime in the evidence of the folded nightcap. It was tried on his head and found to fit him. This indication for what it was worth—and it was not worth much—was definitely made part of the case against him. In principle, however, this was perfectly sound. If it had been possible definitely to connect the accused man with the headgear a very strong case could legitimately have been built up, but in order to prove the connexion between the nightcap and the head it was supposed to have encircled, something more than fitting it to the person of the accused was necessary. Other clues only discoverable by an examination out of the reach of the seventeenth-century technique would have been required to establish anything really conclusive. This is worth noting because it suggests that the preference for direct evidence was at that time in any case a matter of necessity as being the only kind of which the investigators could really make use.

Even in the eighteenth century this remained true, although torture as a means of procuring evidence was disappearing. The Kirkcudbright affair, which will be considered in Chapter VII, was altogether exceptional, and the majority of investigations resolved themselves into a hue and cry, and an interrogation of the suspect if and when he was caught, together, of course, with the direct evidence of witnesses testifying concerning

matters of presumed fact. But the Kirkcudbright investigation illustrates, all the same, that the point of view was changing. It was recognized that the material clue could be utilized if only it were possible to discover how to examine it. As we shall see, the footprints were measured and identified and the nature of the mud on the stockings examined.

In the matter of poisoning, the trials of Mary Blandy and Kitty Ogilvy may well be contrasted. In the first the medico-legal evidence is much cruder than that of to-day was at least reconcilable with our contemporary point of view. The medical witness for the Crown was satisfied with nothing less than scientific proof—within the limitations of the age—that poison had been administered. The trial of Kitty Ogilvy showed an almost medieval point of view in those who tried the girl and her alleged accomplice. The evidence was little better than hearsay and all that the prosecution attempted to establish was evidence of motive, and a presumption that certain passages in Kitty Ogilvy's letters could only be interpreted to mean that she had obtained and administered poison to her husband.

Evidence of this kind is sufficiently clearly established is not to be ignored, and it is not ignored to-day, but it can never be conclusive in the sense that scientific evidence of poisoning is conclusive. Its importance only becomes first rate when it is confirmed by the detection of the poison in the body itself. That is the vital clue.

A very interesting modern example of this is the Thompson-Bywaters trial. Edith Thompson was exe-

cuted upon evidence that she was a principal in the second degree. The case against her depended upon the contents of certain letters she had written to Bywaters. The letters appeared to suggest that she had attempted to poison her husband. No poison was, however, found in his body, and the defence strongly contested the admission of the letters into evidence. The contention was that Edith Thompson was romantically exaggerating and that she had never administered or attempted to administer any noxious thing to her husband ; that she had not incited any person to murder him, nor had any knowledge that his murder was contemplated. The jury were invited to ignore the evidence of the letters altogether.

Whether the plea was legitimate or not, there is at least no doubt that it was the contents of those letters which sent Edith Thompson to the scaffold. Upon contemporary standards there was not a shred of evidence to support the contention that Edith Thompson had attempted to poison her husband. Nothing short of discovery of poison in the body could have established that. The only ground upon which the letters were admissible was as evidence that went to show that the girl had incited her lover to murder.

There seems to be no sufficient reason to question the justice of the verdict and sentence upon both the prisoners ; but it might be legitimate to draw a comparison between the kind of evidence which condemned Edith Thompson and Kitty Ogilvy. There was no question in Mrs. Thompson's case of interpreting a fact from which only one inference could be drawn—the existence of poison in her husband's body.

The matter to be determined was the meaning of the letters she wrote and the motive with which they were written. The court took the view that the matter of the letters amounted to incitement to murder; but there are suggestions throughout the trial which make it evident that the court was biassed in favour of the view that evidence of the letters themselves was sufficient to show that Mrs. Thompson had, in fact, attempted to poison her husband. This quite unjustifiable assumption—in view of the scientific evidence—rather prejudiced the case as far as the woman was concerned.

Here is to be observed a modern example in which the negative aspect of the scientific evidence was set aside in favour of conclusions drawn from evidence capable of being interpreted in more than one way.

The discovery and interpretation of clues can thus be said to fall into two categories and two periods. Formerly, the clue meant information given by an accused person or a witness, and its value depended upon the reliability of the statement made. To-day such information would hardly be described as a clue at all, and wherever possible it is tested against collateral facts capable of scientific interpretation which in itself admits of no dispute. The first period might be described as purely legal. The second, that of to-day, is the legal and the scientific.

It will be recalled, however, that circumstantial evidence has always, at least in theory, been regarded as sufficient to establish innocence or guilt. And in the case of Mary Ashford it was laid down that it might be as conclusive or more conclusive than that

of the human witness. In practice, however, this did not hold good for the reason that the technique in connexion with circumstantial evidence was undeveloped. The Mary Ashford affair is one among many others where the lack of technique produced such confusing results that no definite conclusions could be arrived at. (See Chapter III.)

That is why so much more attention is now given to scientific evidence. It is recognized to-day that scientific evidence, if it is only precise enough, has quite a unique value. The personal equation does not enter into it; within its limitations—they become less and less restricted as science advances—it is quite infallible.

The folded nightcap found on the bed where Lady Mazel was murdered was fitted to the head of the butler, Le Brun. Evidence that it fitted him might or might not connect him with the crime. But a modern examination would have included a minute search for hairs which are nearly always to be found upon headgear. By means of a micrometer scale fitted into the eyepiece of the modern microscope the width of such a hair could easily be determined. A comparison of that measurement with a hair from the head of the accused would have been made. The microscope will sometimes reveal by the structure of the pigmented area what was the colour of the hair. Parasites or their eggs may be found. Comparisons can be made of these infinitesimal indications which may establish the identity of a single hair beyond reasonable doubt. That is one good example of a modern clue. It must be described as modern because

it could not have been utilized as a clue at a period when microscopic measurement and diagnosis of such things could not be carried out.

It is interesting to remember that since the discovery of fingerprints the whole tendency has been to endeavour to develop, whenever possible, a scientific technique in connexion with clues which will help to establish absolute identity of the particular thing with a particular person.

The examination of bloodstains is a case in point. It was once considered sufficient if it could be shown that a particular stain was blood at all. This is at least of value as indicating that blood has been shed if nothing more. But the problem frequently arose as to whether the blood was of human or animal origin. This difficulty was overcome in its turn by Bordet's discovery of specific serum. More recently the group test has made it possible to connect a particular bloodstain with a particular individual. Dervieux, whose researches have received some notice, has gone further and with his specific serum prepared from sperm has claimed that the actual identity of a stain can be detected. Without considering how far this claim is justified, in actual practice it indicates the direction in which this kind of research is proceeding and its ultimate goal. The aim is the identification of the individual. That is the kind of clue which interests the scientific detective.

Failing identification of the individual the establishing of his occupation is of considerable value. There seems to be some doubt as to the origin of the technique of the examination of and search for occupa-

tional dusts, but Hans Gross was among the first to allude to it and illustrate its value. He quotes as an example a coat which was found upon the scene of a crime and an examination of the dust found in it. The debris proved to consist of small fragments of wood intermixed with gelatine. Upon this evidence the conclusion was drawn that the owner of the coat was a cabinet-maker and joiner. A suspect was later arrested and it was ultimately proved that he was the author of the crime. His occupation was that of a cabinet-maker.

This is an early and comparatively elementary example of the identification of dust. Since that time scientific examination of this kind has been greatly developed and systemized.

The method originally employed for the removal of dust from clothing was to enclose the material in a strong paper bag which was beaten. The dust was then removed from the bag and examined. A special vacuum-cleaner is now generally used with a receptacle constructed to make the removal of the dust easy.

The wax in the ears, the dust in the nostrils, and the deposit under the nails are also examined with a view to determining their composition. A very varied number of substances have been identified giving clues to numerous occupations. Starch, generally of wheat, is found in the ears of bakers. Metallic dust in the case of metal-workers. Mineral matter of various kinds is associated with miners. Workers on the road breaking stones show siliceous particles. Butchers, lacquerers, druggists, brickmakers, bootmakers, and leather workers also show characteristic dusts of

occupation. Examination of this kind is now made part of the ordinary routine in police laboratories in Germany and France, and it frequently supplies very valuable information regarding a suspected person.

Dust is a very penetrating substance, as every housewife knows, and this fact led Professor Severin Icard to make a special examination of the dust to be found in watches. He discovered that in most cases the dust in a watch gave an indication of an individual's continual association with a particular substance. Professor Icard discovered, for instance, appreciable quantities of snuff in the watches of two French abbés who were subsequently proved to be strongly addicted to this habit. Corresponding occupations were also checked by the examination of the watches of bakers, mechanics, and stonemasons.

The examination of dust is a recent development of forensic science, but it has found practical application for a longer period than is generally believed. Professor Popp, who has been one of the pioneers of this branch of research, gives a very interesting illustration of its use as long ago as 1904.

The affair was one of murder of a middle-aged woman in the countryside near Wildthal. She had been wounded in the neck with some sharp instrument, but the actual cause of death was strangling which had been produced by a silk cord of red and blue which the murderer had left in position round the neck. A minute examination of the victim's clothing revealed besides bloodstains abundant traces of snuff. There were further dark stains which proved to be partly composed of coal and coke. Beside this there were

grains of sand which on microscopic examination were found to consist of mica and another double silicate of calcium and magnesium.

The same evening a suspect was arrested and a detailed examination of his clothing and the deposit under his fingernails was made. Mica and the other minerals were clearly identified, together with traces of coal and coke. More important still, clinging to two of his fingernails minute strands of red and blue silk were found. A knife was also discovered in his possession slightly stained with blood.

The suspect had declared that on the day of the murder he had worked in a sand-pit and a few days before in a gas works. It was proved quite conclusively from the nature of the dusts found upon his clothing and under his fingernails that part of his statement was untrue. The sand in the neighbourhood where he had alleged that he had been working did not agree with the material found at that spot, but agreed exactly with the nature of the minerals found in the neighbourhood where the crime had been committed.

The accused ultimately confessed to the crime and was convicted.

Here is an application of modern technique of first-rate importance, an application which broke up a manufactured alibi which it might otherwise have been difficult to disprove. This is perhaps one of the most important applications of the scientific examination of dust and mud. In a related connexion there are a number of examples where the mud upon boots has indicated the locality of a suspect at a material time.

It is of interest again to refer by way of comparison to the Kirkcudbright affair. In that investigation the principles of this line of inquiry were recognized as important, and an attempt was, in this case, successfully made to apply them. The mud on the suspected man's stocking was examined and compared with that near the scene of the crime. But there was lacking the systematic precision which marks this German case of 1904. An actual identification of the minerals by the form of their crystals would not have been within the scope of the eighteenth-century technique. On that particular occasion the experiment succeeded, but the examination of minute traces and their identification beyond all reasonable doubt which belongs to this more recent example would not have been possible.

The examination of dust in clothing was sporadically practised before this date. The best-known English example is the famous Maybrick case of 1889 which has been discussed in some detail elsewhere;¹ but the preliminary investigation included an examination of the pockets of Mrs. Maybrick's dressing-gown. Appreciable traces of arsenic were found mixed with the dust in the pockets. It was, in fact, the practice at this time in cases of suspected arsenical poisoning to make a search for traces of arsenic in the clothing of the accused, and the case of Mrs. Maybrick is not a unique example of the application of this method.

But it remains true that systemized investigation belongs definitely to the twentieth century. While it

¹ Ainsworth Mitchell, *Science and the Criminal*; Henry T. F. Rhodes, *Some Persons Unknown*.

was initiated on the Continent, a recent example of its application in this country is the murder of Vera Page. In this horrible affair is to be found an instance of a very brilliant police investigation, and the fact that the mystery has not been completely cleared up in no way detracts from the energy and efficiency with which that investigation was conducted. As a result of an examination of the child's clothing it was proved conclusively that her body had been placed in a coal cellar or in some place where coal was kept. From the report of the Coroner's Inquisition it does not fully appear how vital this piece of evidence was. This is another example of the value of a clue of this kind for the purpose of establishing locality. The failure of the investigation was not due to the leaving of anything undone which should have been done. The case is on the contrary remarkable for the amount of information which was extracted from such apparently insignificant material. But there was not enough of it. An additional scrap of evidence, however apparently trifling, might have changed the course of the whole investigation. A court of law naturally requires to be convinced in any affair relying wholly upon circumstantial evidence of this type, that it is sufficient in amount, and agrees in all its parts and aspects. Strong suspicion or even moral certainty does not constitute judicial proof. The experience of civilization has taught us that only in judicial proof is absolute safety to be found.

This in no way justifies us in supposing that this particular example ought to be counted a failure. Had this line of inquiry not been prosecuted the

investigation could not usefully have proceeded at all. No unsolved mystery is ever closed. The police are still in possession of the facts which lead them to certain conclusions. At any time something else may come to light. Of very little importance in itself, when considered in relation to other evidence also in itself inconclusive, it may clear up the whole matter. Pieces of evidence apparently irrelevant or insignificant cease to become so as they fall into their allotted places in the completed structure of an unanswerable case.

Such are representative illustrations of what is meant by the modern clue. We have observed its development in this review. In early examples it was disregarded altogether almost, as it were, on a principle of law which could deal with nothing but direct evidence. Later there is a tendency to utilize evidence which was distinct from the testimony of witnesses. The prejudice, however, remained, but it ceased to be one of principle ; it was due rather to the elementary technique which made it very difficult to interpret evidence obtained in this way. In modern times the advance of science has altered this position, and it will have been evident from the examples quoted first that scientific evidence of this kind is an increasingly common feature of criminal inquiry, and that it is much more often successful than it was in times past.

RECONSTRUCTION OF THE CRIME

CHAPTER III

THE PROBLEM OF MARY ASHFORD

EARLY in the morning, actually at half-past six on the 27th of May, 1817, a labourer on his way to the Penn Mills in the neighbourhood of Erdington, Birmingham, took a short cut across the fields. At a point not many yards from where the footpath came out on to the main road his attention was attracted by a pair of shoes, a bundle, and a bonnet. These lay near the edge of a pool of water of some depth. The labourer approached and on closer inspection noted that one of the shoes was covered with blood, that at some distance there was a large patch of blood on the grass, and that there was a trail of blood leading from it to the pool.

The clues appear to have been observed with some care if reliance is to be placed upon the evidence given at the trial. The patch of blood was located at forty yards' distance from the clothing. That was not all. The grass showed the impression of an extended figure, the patch of blood corresponding with the lower portions of the impression, and there were also in the vicinity of the impression prints of large shoe toes. The spots of blood were traced for ten yards in the direction of the pool. No footsteps corresponded to the trail of blood from which it was inferred that the body had been carried in someone's

arms who had walked on the path. This inference was anything but sound. It was suggested that the dew would have been disturbed had the grass been walked upon, but there was no evidence that the blood had not fallen before the dew, and in any case there were no footprints elsewhere on the grass where it was subsequently proved that the alleged murderer and his victim must have passed.

The labourer, at any rate, disturbed by these sinister indications, hastened to the mill and returned with some other men, among them one named William Lavell who with another made a survey and the observations described.

The pond was dragged, and the body of Mary Ashford, a young local girl, was recovered. An autopsy revealed the presence of half a pint of water and some duckweed in the stomach, so that it was concluded that she must have been alive when she entered the water and that she died of drowning. The girl had not been *virgo intacta*, but there was no evidence whatever of violation without consent.

After the recovery of the body the examination of the scene of the tragedy was continued. The footprints discovered were probably the most remarkable ever observed in any affair of the kind. These traces were discovered in a newly harrowed field next the one containing the pool. They proved to be those of a man and a woman. The disposition of the prints, their depth and length, suggested that the man had pursued the girl and ultimately caught her up. At the point where she had been overtaken the two sets of footprints returned side by side in the direction of

the pool and the impression in the grass. They could not be traced over the entire distance on account of the hardness of the ground in the neighbourhood of the pool.

The marks of the man running were also noticed, alone, in a direction away from the pit and across the harrowed field.

There was further on the edge of the pit a mark of a left shoe or boot; but it was never established satisfactorily that this corresponded with those discovered elsewhere.

On the evidence of these imprints, impressions and stains, the affair was reconstructed as follows: A man had pursued the girl across the harrowed field and overtaken her. They had returned walking together to the place where the impression on the grass was found. Sexual intercourse had there taken place. The man had carried the girl to the pool and thrown her in.

This reconstruction appeared on the face of it to be not only highly ingenious but practically flawless; and it was conclusively proved to be completely wrong.

A man named Abraham Thornton was later arrested and charged with the murder of Mary Ashford. Both had been present at a dance at Tyburn. It was not disputed that they had left together at about midnight, and on the evidence of a reliable witness had been seen in conversation at a stile not far from the spot where the supposed crime had taken place at about 3 a.m. The boots which Thornton wore fitted the impressions found in the harrowed field while those of the woman fitted Mary Ashford's shoes.

The behaviour of the accused—for what such evidence is worth—was not consistent with his guilt. On first hearing that she had been murdered he expressed great surprise and remarked that he had been in her company until four o'clock in the morning, an admission so damning as to be consistent with innocence rather than with guilt. He also readily admitted having had intercourse with her, and declared that it was with her consent. This was more or less substantiated by a witness who remembered that at the dance Thornton had told him that he intended to seduce the girl. This was a most damaging confession for a guilty man.

The defence was an alibi, the authenticity of which was established beyond all reasonable doubt.

Before considering this, however, the condition of the girl's clothing must be considered. The parcel contained the frock she had danced in ; it was slightly spotted with blood. The skirt of the frock she wore when her body was discovered was much stained with blood, as were her stockings. That both sets of garments were bloodstained is a significant detail which will be considered later.

There is no doubt that the girl was alive as late as about 4.30 a.m. At four o'clock she had called at the house of Mrs. Butter, where she had left the parcel with her clothes, and there had changed her dance frock, stockings, and some other clothing for the pink frock she wore when the body was discovered. She appeared to be in good spirits. She left the house at about 4.15, was seen by a reliable witness at 4.30 a.m., and must have reached the pool about 4.35.

Between 4.30 and 4.35 Thornton was seen by four people, all of whom were unacquainted with him, walking along the road two miles and a half from the scene of the tragedy.

He was observed again still farther away but on the same road at 5.25. At half-past six the crime was discovered. On the theory of his guilt, Thornton would have had to walk or run three and a half miles, chase the girl, violate her, arrange the bundle and shoes, drown his victim, and return in the space of an hour and five minutes. The thing was impossible.

There was much prejudice against the accused, but at the trial he was acquitted after a consideration by the jury of only six minutes.

The summing up of Mr. Justice Holroyd was a model of lucidity and impartiality. After pointing out that the evidence for the prosecution was in this case entirely circumstantial, and indicating the conditions which might cause the jury to think that it was defective, he outlined the facts.

Crimes of the highest description, it is certain, may be proved by circumstantial evidence only, and sometimes that kind of evidence is the strongest of all others. But then it must be taken and compared in all its parts and considered in all its bearings. Witnesses might vary in their testimony in stating the appearance of the same things; but facts could not be altered; they always spoke for themselves, and would not give way to opinions. . . .

But in one point of view—with a view to infer the probability of his guilt—it would be very material to consider at what time the connexion took place, whether before the deceased went and changed her dress or afterwards. Because if you think the connexion took place previous to that time, then the deceased coming to Hannah Cox's and making no

complaint at all against the prisoner, would show that if it had taken place before, it had taken place by her consent, or that the inference would be too uncertain to form any argument against the prisoner.

These things are material in considering whether having regard to the times at which the prisoner was proved to be at considerable distances, the connexion could have taken place after that time, that is, if the witnesses for the prisoner have spoken the truth. . . .

Supposing the connexion had taken place at a prior time, before the deceased had returned to Hannah Cox's, then the question arises as to whether there had been a fresh attack upon her.

This summing up is of very great interest, first as indicating the scrupulous impartiality of the proceedings at this trial, and secondly, as throwing light upon the point of view from which circumstantial evidence was regarded at that time. It was at least in this case acknowledged as being, when properly applied and understood, of equal merit with direct evidence.

The technique of detection was also, in this affair, very intelligently utilized. But what is really important is the fact that had the investigators had at their disposal the scientific machinery now applied to criminal inquiry, the mystery of the death of Mary Ashford might not have been handed down from the past as a mystery at all.

An examination of the footprints was made, and there seems to be no doubt that they were in fact those of Mary Ashford and Abraham Thornton. But the method employed was to fit the suspected footwear to the impressions, and thus to decide their identity. This method was commonly used at that time, but it

is very far from conclusive, and has in more instances than one led to a serious miscarriage of justice. The isolated footprint which was not proved to correspond with the left boot of the accused was apparently never properly examined at all. This was most likely on account of its apparent dissimilarity to the others when tested by this method. To-day, a photographic record and a cast would have been preserved of so curious and possibly so vital a clue.

The clothing of the accused carried some small stains of blood which at that time could not readily be identified. Evidence that it was human blood would have been of very great value. The group test would now be applied, and while if the blood was proved to belong to the same group as that of the deceased, it would not have proved conclusively that it was or was not the deceased's blood, such evidence might have been of great value when taken in conjunction with other facts.

No examination of the blood found on the grass could have been made. Had it then been possible to do this by modern methods, the nature of the blood might have been decided; if, for instance, it could have been menstrual blood. It will presently be seen how vital a bearing such a decision might have had upon the inquiry.

It must be borne in mind that an autopsy was made by which it was proved that the girl had previously been a virgin and that she had had intercourse, probably with consent, for the first time. It should have been possible to decide if the girl had menstruated, but diagnosis at that time sometimes lacked precision

even in such matters as these, and it is not incredible that this condition might have been overlooked.¹

What is the truth of this strange affair of Mary Ashford's fate ? Did she commit suicide ? Did she fall into the pool accidentally ? Or was she murdered by some other person unknown as she passed the pool for the second time on her way home after changing her clothes ? This doubt, of course, depends upon the assumption that the witnesses for the defence testified truly which, having regard to their number and to the circumstances, seems to be an irrefutable conclusion.

Let us consider the facts. It was not disputed that Abraham Thornton and Mary Ashford met at the dance, danced, and left together at or about midnight. Upon the defendant's own admission, supported by independent evidence, he intended to have intercourse with her, an admission which he would not in any case have made in the circumstances if it were not true. Further, on the defendant's own admission supported by independent evidence at a material time (three o'clock) he had been wandering about with the girl. This supports his admission of the intended intercourse and suggests that the girl knew of that intention or suspected it, or she would hardly have remained in his company at so unusual an hour.

There seems to be no doubt that the intercourse did take place as the defendant declared between midnight and four o'clock in the morning. But there must have been grave doubt of this at the time, or there would have been no attempt to lodge the Appeal of

¹ The menstrual discharge might have been suppressed by the immersion in cold water.

Murder. It must have been supposed either that the intercourse and supposed murder took place both at one time after four o'clock or that the intercourse took place before four o'clock and that after parting Thornton again met the girl, and then threw her into the pool. This assumed, of course, that all the evidence of identification was bad. Nothing is more improbable than this, but it will be interesting to see if the circumstantial evidence of the traces left on the scene of the supposed crime could, by themselves, establish the time when the intercourse took place.

The remarkable fact has already been noted that an impression of what appeared to be a human body was found on the grass with a *patch* of blood corresponding to the lower part. Further, there was a trail of blood-drops from this impression to the pool, but no footprints anywhere on the grass. The full significance of this interesting indication does not seem to have been grasped. It was explained by assuming that someone had walked on the path carrying the girl. It in fact proved nothing since no footprint was found on the grass over which it was necessary to assume both had passed.

Why then was there an impression of a body but no footprints of any kind ?

Because the impression and the footprints had not been made at the same time, neglecting for a moment the set which might have accompanied the trail of blood-drops.

Every kind of footprint or other impression has now been made the subject of scientific study, those on grass being of particular interest. Not in all circum-

stances, if the ground is dry, will grass take impressions, but in any case their distinctness and indeed their presence at all will depend upon when they were made. The imprint is, of course, produced by the grass being pressed more or less flat under the weight of the foot. But the blades rise again and so obliterate the trace. The duration of the print will depend upon the condition of the grass and the ground.

It was assumed by the prosecution that the man had chased the girl, overtaken her, and that they had walked towards the pool on to the grass where the act of misconduct—corresponding to the impression—took place. All this might have been, and probably was true, but that the impression was the *corpus delicti* of this act is open to grave doubt. If it had been, there should have been footprints also on the field. At a prior time they probably had walked over the grass, but the footprints had disappeared, together with the imprint on the grass their misconduct might have produced, if it actually took place there.

What of the impression and the patch of blood ?

In considering this significant indication it is well to remember the curious circumstance that the dance frock was spotted slightly with blood, but that the pink frock into which the girl had changed and clothed in which her body was found was, in the skirt part, drenched with it, as were her stockings and one of her shoes.

Prior to four o'clock she was known to have been wearing the dance frock. The spots of blood upon it are the strongest possible presumptive evidence that it was while wearing this clothing that she was

seduced. The copious bloodstains upon the other frock, however, were not consistent with seduction, or even with intercourse with violence unless there had been such brutality as no medical man could fail to have noticed when making the autopsy.¹ The evidence of the two bloodstained garments suggests two separate incidents, one before one o'clock, and the other afterwards. What was the second incident ?

The body impression upon the grass provides a possible answer. It might be assumed to belong in time to a period considerably after four o'clock, since it was the only impression left on the grass. It might, in fact, have been made when the girl returned alone after changing her dress. Mary Ashford had been working all day, dancing until midnight, had walked about for a considerable time with Thornton, and at some period had had sexual intercourse with him. She must have been, while walking home, thoroughly exhausted and arriving near the pool exhaustion overcame her ; she may have laid down on the grass, and dropped off to sleep.

The patch of blood on the ground probably corresponded to an unprepared-for menstruation. The girl, rousing herself and finding her shoe and stockings bloodstained, took off her shoes and carried them towards the pool with the idea of washing them and also attending in the same manner, and as well as she could, to her dress. She might well have walked on the path and held the shoes away from her over the grass so that the drops of blood on the turf

¹ Hemorrhage sometimes follows violation, but hardly in these circumstances.

emanated from them; but however that may be, the impression of her stockinged feet might not have persisted even had she walked on the grass.

Overcome by her exhaustion and the loss of blood, she may well, in trying to draw water from the pond in her cupped hands, have slipped in and been drowned. This may have occurred only a short time before the labourer discovered the tragedy, and having regard to the clearness of the impression of the recumbent figure, it is extremely probable that it was very recent.

The only point for which this reconstruction does not allow is for the alleged impression of boot-toes in the neighbourhood of the impression of the recumbent figure. There is some justification, however, for accepting this evidence with caution. Toe marks are by no means easy to identify. The ground was comparatively hard, and it is very difficult to account for their presence even in the circumstances which the investigators deduced, and which might therefore have suggested to them what they thought ought to be found there.

It might be legitimately argued that this reconstruction is flimsy and hypothetical, and it is, of course, quite true that without the rest of the evidence it would be dangerous to draw a positive inference from these indications. On the other hand, it must be remembered that it fits in with the direct evidence and as a theory reinforces the inevitable verdict of not guilty which the jury found.

There is something more important than this. This hypothetical reconstruction would have been

made such as would have carried conviction, or shown to be incorrect if modern scientific technique had been available on the scene of that unfortunate affair. There would first have been precise information as to the girl's physiological condition. All the different samples of blood would have been examined biologically. A close examination of the ground would have been made for any minute traces of blood and other material which might have indicated the passage of a stockinged foot along the path or on the grass.

Most important perhaps of all, a person of approximately the same weight as the accused would have stretched himself upon the grass for given periods so that the impression could be observed and the angle which the blades of grass lay out of the perpendicular noted at stated intervals of time in order to compare the angle of slant with that of the grass in the impression under investigation. By this means the approximate time of rising from the grass could have been determined and thus perhaps the time at which the tragedy took place. I do not know if a technical examination of this kind has ever been made in practice, but it is a method employed in the examination of ropes which have been used by house-breakers. The fibres stand out from the rope as blades of grass stick out of the ground. If the rope is used to climb or slide down the fibres are bent in the horizontal direction. But they slowly regain their original position. Experiments and measurement of the angles will often determine the approximate time at which the rope was used.

This example of reconstruction has also a moral. Circumstantial evidence is often not complete enough to acquit or convict, but it can very often confirm or disprove. In this affair there was a great deal of circumstantial evidence upon which an hypothesis was built in some respects clean contrary to the direct evidence. Circumstantial evidence must not be blamed for this, but rather the primitive technique which was unable to deal with much which might have proved, in conjunction with the direct evidence, or even without it, absolutely conclusive.

From an historical point of view the case is interesting as showing that importance was beginning to be attached to examinations of this kind. It is true that wrong conclusions were drawn from it which were perhaps inevitable in the circumstances, but those conclusions did not convict the accused, and were indeed recognized as presumptive and to some extent fallacious by the judge and jury. It must be borne in mind at the same time that in many material particulars the conclusions were correct, and might have been completely so if biochemistry and systematic medico-legal examinations had been the rule and not the exception.

Nothing more is really claimed for the reconstruction quoted here than that it illustrates how scientific methods can be linked to the reconstruction of a crime real or supposed. It illustrates too the elementary process indicated by Sherlock Holmes—when you have eliminated all the impossible solutions then the solution or one of the solutions remaining, however apparently improbable, must be the right one.

CHAPTER IV

A STUDY IN RECONSTRUCTION

FROM one point of view it might be said that the technique of reconstruction is a modern development in the detection of crime. This is true of one aspect of it, but in regard to the other it cannot be said that there is no historical background. There are two different meanings to the word reconstruction. One form of it is to conduct the accused person to the place where the crime was committed, and there to re-enact it in his presence. It is assumed to be a matter of psychological fact that if the reconstruction is correct in essentials, and if the accused person is guilty, he will confess his crime.

Leaving aside for the moment the question as to the validity of this assumption, it is true that this is a recognized part of the police procedure of many European countries. The United States of America employ it also. The American criminal who has proved obstinate under interrogation is, in the literal sense, often taken for a ride. The motor-car is driven past the scenes likely to recall the crime to the suspect, and the detective in charge of him carries on the interrogation in, as it were, the appropriate surroundings. It is claimed by Carey and others that this method will often cause the accused to "speak the truth when all others have failed.

This is of great interest ethically, historically, and scientifically. From the ethical point of view there is great disagreement as to the justification for this procedure, and in Great Britain the method is not tolerated. Justification might perhaps be made to rely upon psychological theory. If it could be shown that the guilty person could be made to speak the truth by this method, and that the innocent always emerged unscathed, it would be difficult to condemn the practice. But the evidence to support this contention is hardly strong enough to make it a plausible assertion. It is hard to see how it could distinguish between a principal and an accomplice, and there is no certainty that local associations not related to the crime, or to the particular crime in question, might not produce psychological reactions regarded as suspicious in an innocent person.

However this may be, it is the historical aspect which is really the most important. Even if those who subscribe to the theory do not know it, it has hardly arisen out of a study of modern psychological principles, but is rather a survival of the medieval theory of jurisprudence brought up to date in technique. There is not, after all, a great deal of difference between conducting the accused man into the presence of the corpse and causing him to take hold of the hand, and the modern type of reconstruction we have considered. The difference lies in the fact that the seventeenth-century man believed, or affected to believe, that if the accused were guilty his contact with the corpse would cause the wounds to bleed afresh. But even at that time the conviction was

not very courageously held. Suspects were convicted even when the corpse did not bleed, and they were convicted, or at least more strongly suspected, by reason of just those indications taken into consideration to-day by those who consider such methods sound. That is to say, if the accused person blanched, trembled, or otherwise committed himself, this fact was taken into consideration, and often much was made of it.

There is a sense, therefore, in which this very modern technique of reconstruction relies upon a medieval principle. The intention clearly is to cause the accused to provide evidence against himself by confession. How far it is justifiable to obtain and make use of evidence of this kind is not easy to determine. It cannot be claimed that confession of guilt ought to have no place in jurisprudence. In this country statements are taken from accused persons under proper safeguards. But the suspect is not induced to confess. In any reconstruction of a crime by the methods described the inducement is there even if it is not forcibly and directly applied. In connexion with confession also it has been suggested that hypnosis might be used to extract a confession, and more recently it has been claimed that certain drugs can be utilized to the same end. There is further the practical application of the maxim "*in vino veritas*" and the "third degree."

But this is not the traditional meaning of the reconstruction of the crime. Reconstruction in the older sense, even before the term was used, meant rather the reconstruction itself apart from the reaction of that reconstruction upon the accused person. Its

object was to decide how the crime was probably committed, and the order of the events. Allusion has already been made to simple instances of this kind. There is the type of experiment carried out by Hans Gross to decide the form taken on by blood-drops in relation to the movements of the wounded individual. The affair of Mary Ashford is an illustration of the same type.

In this kind of example re-enactment of the affair is no necessary part of the procedure. It is merely a question of fitting the known parts together and endeavouring to fill in the missing parts as far as possible and in so far as those unknowns are directly and inevitably deducible from the known. This is a scientific conception. Neither in mathematics nor chemistry, nor criminal investigation is it always necessary to establish all the facts independently. If it is given that $x + y = 2$ it cannot be said that we know everything about x and y , but we can demonstrate as a matter of certain fact that $x + y - 2 = 0$.

That is the object of this kind of reconstruction. If certain facts are definitely established it may well, and generally will be true that certain conclusions are inevitably deducible from them. There are even circumstances in which a picture of the affair, accurate in all essentials, can be reconstructed from comparatively few facts.

This review has so far treated as distinct the reconstruction which leads up to suspicion, and the use of it in connexion with the suspect himself. In fact, however, the two methods meet and blend. It is quite clear that if a reconstruction has been made, it

can and must be utilized in interrogating the suspected person. That which the police suspect, or know, will naturally influence the questions put to an accused person or a material witness. That state of things is allowable and even inevitable even in places where the law does not permit the police to re-enact the drama in the presence of the suspect person.

The Voirbo case presently to be described has been chosen because it is perhaps among the best illustrations of reconstruction. Small clues were discovered and fitted together with great subtlety and a nice appreciation of their value as evidence. There was finally an actual experiment in reconstruction quite classical of its kind. It was of the mixed type because on the one hand it was carried out not only to forge the last link in the chain of evidence, but it was also carried out in the presence of the accused person to ascertain the reaction upon his mind.

The detection of the crime of murder when the author has successfully contrived the concealment of the body of the victim is greatly complicated. Where there is rapid discovery facts which may be of vital importance are fresh in men's minds, and thus are of great value as evidence ; but after a lapse of months or years it may be impossible to glean anything definite at all. Most of the material clues will also have disappeared save those surrounding the discovery itself. The greater majority of murder mysteries which have remained unsolved or in which it has been impossible to bring the crime home have been those in which there has been concealment of the body. Although Eugene Aram was tried and convicted of

murder in 1758, this example is a good illustration. The defence was very strong, and the weakness of the prosecution lay in the fact that the discovery of the body, or rather skeleton, was made so long after the murder that the crime was difficult to reconstruct. There was, in fact, nothing to connect Aram with it except that Houseman, his accomplice in fraud if not in murder, was apprehended on his own indictment, acquitted, and admitted to king's evidence.

In the extraordinary affair of the murder of a man named W. Huntley in 1830, whose remains were not discovered until twelve years later, the murderer, Goldsborough, seems to have been suspected at the time. Valuables belonging to the dead man were found upon him, and a quantity of blood was discovered on a track near a wood where the two men had been poaching. Although Goldsborough was interrogated he was not arrested in spite of the strong suspicion which must have been attached to him. When the skeleton was discovered in 1842 in a hole near the river it was identified beyond doubt as Huntley's. Goldsborough was apprehended and tried, but there was no evidence on which he could be convicted after this lapse of time.

The famous Voirbo case discussed fully by the well-known French detective, Macé, in *Mon Premier Crime*, belongs to 1869. It opened with a complaint made by a restaurant keeper regarding the smell and taste of the water in his well. He had examined it and discovered that a human leg was floating on the water. This man, named Lampon, at once informed the police.

The well was dragged, and the limb in an advanced state of decomposition was recovered. Gustave Macé, then a commissioner of police, was summoned and took charge of the case. A further examination of the well was made under his direction, and as a result another leg was recovered in a parcel. The covering material was important. It was of black calico knotted at each end, and sewn with black thread. The limb was further covered with a piece of trouser-leg of grey cloth. All identifying marks had been removed, but on part of a stocking to which a sock had been attached which also covered the leg a mark was found. It consisted of a B with a plus sign before and after it.

These clues were slight enough, but the establishing of identification was complicated by a mistake made by the medical experts who stated positively that they belonged to a woman, and that they had been in the well for about a month.

The discoveries were connected with similar gruesome finds in other parts of Paris—a thigh bone in the Rue Jacob and morsels of flesh in one of the canals. Other suspicious circumstances possibly relating to the crime were reports that a man had been seen throwing what appeared to be small pieces of meat into the river. When questioned he had replied that it was bait for the fish so that they would rise well on the morrow. The date of this incident was important. It was December 19th, two days after the discovery of the thigh bone.

It was then recalled that on December 22nd in the early morning a man had been interrogated by two

sergents since he was carrying a parcel which they suspected contained stolen goods. He told a plausible story and was permitted to proceed. The man was not identified, but it was suspected that his parcel may have contained human remains.

The mistake regarding the sex of the remains caused delay. A careful analysis of the disappearances among women led to nothing.

The eminent Dr. Tardieu then re-examined the limbs. He pronounced them to be those of a man, and noted a scar on one leg which he considered recent. Identification was very difficult without the head which was not recovered.

The laborious but brilliant reconstruction began.

Black calico and sewing suggested the work of a tailor, and a careful search for tailors in the neighbourhood of the Rue Princesse, where the body was found, was organized. No male tailor was traced, but after patient interrogation a seamstress named Mlle Dard was reported as having lived in the neighbourhood. She had of late become a singer in the cafés. M. Macé discovered that she was supplied with work by a man who used to carry up water from the well for her.

Mlle Dard was located and interrogated. She gave information quite willingly, and finally admitted that a certain Pierre Voirbo was among her clients. It was he who carried the water upstairs for her.

Further questioning elicited the information that Voirbo was often in the company of a man named Père Désiré and his aunt, Madame Bodasse.

Madame Bodasse was interrogated and admitted

that Père Désiré was her nephew. She had not seen him for some months, but this did not surprise her, since he was very eccentric and often disappeared for long periods.

It was this witness who identified the wrapping on the remains. The grey tweed of the trousers was declared to correspond with that of her nephew. Madame Bodasse positively identified the initial B and the two plus signs as being the work of her own needle. Her nephew had suffered from the cold, and she was accustomed to sew the upper part of stockings on to his socks to give increased warmth. The woman further gave evidence as to the existence of a scar on her nephew's leg.

There was now strong presumptive evidence as to the identity of the murdered man, and inquiries were therefore made at the house where he had his apartment. It was there suggested that he was still alive, since a light had been seen in his room not many days previously.

Whatever doubts this evidence may have raised, M. Macé kept the apartment under observation. Inquiries were made in the meantime regarding Voirbo, who, it was discovered, had a bad record. He had recently married, and had been heard to remark that his friend, Désiré Bodasse, had disappeared the day before the marriage, although he had promised to be present at the wedding. It was further ascertained that Voirbo had demanded a loan of 10,000 francs which had been refused.

Since nothing had been seen of Désiré despite the evidence of the light in his room, the detective

decided to obtain a search-warrant and examine the apartment.

The room presented a most interesting appearance. It was in order, but obviously had not been occupied for some time, since there was a layer of dust on the furniture. The bed was undisturbed. Seventeen spent matches were found in the fireplace. On the mantelpiece were found two boxes of candles, one of which was empty while the other contained only one candle. It appeared, therefore, that fifteen had been burnt, the boxes having held eight each.

Experiments were carried out with this type of candle, and it was proved that it burnt on an average for three hours. The *concierge* confirmed the fact that the light had been observed to burn for about three hours and on some fifteen occasions. The inevitable conclusion was drawn that Désiré Bodasse had not burned these candles, but that someone who wished it to be thought that he was occupying his room had lighted them. As an additional precaution the trespasser had even wound up the clock, for it was going when the search was made.

It was now practically certain that there had been no mistake in identity, and that the remains were indeed those of Bodasse. The motive for the murder was also clear, since counterfoils relating to Italian stock were found in the room, but the certificates themselves were missing. Bodasse was known to have kept such things in his own possession.

Further inquiry produced a description of the man last seen with Désiré Bodasse. It was independently identified by more than one person as Voirbo whom the

police had already ascertained to be one of Bodasse's associates.

Voirbo was then identified by a money-changer as a man who, on or about a material date, December 16th, had cashed a share certificate of Italian stock of 500 francs.

Police officers were set to watch Bodasse's room in the hope that, suspecting nothing, Voirbo would return to repeat his deception of lighting the candles and winding the clock.

It is a curious fact that this man was himself a secret agent of the police, and it seems to have been for this reason that he did not fall into this trap. Either the policemen set to watch had not been informed as to the identity of the man who might visit the room or else they were taken in by his credentials as a secret agent and assumed that there was some mistake. They did not, at any rate, arrest him, but on the contrary allowed him to enter the room.

The evidence against Voirbo was thus still incomplete, but he was summoned to the commissioner's office for interrogation. He endeavoured with great ingenuity to throw the blame upon three other men. They were shadowed, but no evidence against them could be found. Voirbo was again summoned for interrogation and finally arrested.

He was searched, and a steamship passage ticket was found upon him in the name of Saba. The *juge d'instruction* could extract nothing from him. The case did not look like being a simple matter, but Voirbo was held pending further investigations.

A thorough search was made of his rooms, but nothing incriminating was found. His wife, however, testified that he had possessed Italian securities to the value of 10,000 francs.

The only indication which was at all suggestive was a sewing machine which had been in his tailor's workshop. It had upon it one small spot of blood, a clue which might be without significance. In the workshop were found instruments which might have been used for dismemberment, and cord similar to that used to tie up the parcels in which the remains had been enclosed, and labels said to be similar to those on the baskets carried by the man whom the police interrogated on December 22nd.

The cellar was searched and was found to contain two casks of wine, a short length of string was attached to the bung of one of these casks. It was found to be attached at the other end to a metal container carefully closed and immersed in the wine. On opening it the securities were found.

This was an important piece of evidence, but it remained to prove the vital point of the dismemberment. It was in this connexion that perhaps the most remarkable piece of reconstruction that has ever been carried out with regard to any crime was conceived.

There was in this case the formidable difficulty to which allusion has been made. A considerable time had elapsed since the crime had been committed. It was obvious from the evidence which the police had so laboriously collected that the murderer had covered his traces with cunning and ingenuity. It was suspected that the dismemberment had been carried out

in the room which Voirbo had occupied. But to suspect this was one thing, to prove it was another.

Voirbo was photographed after a violent resistance, and he was conducted on M. Macé's instructions to the supposed scene of the crime. The detective had noticed that the floor was tiled. A rearrangement of the furniture was made approximating to its position when Voirbo occupied the room. In the presence of the accused Macé stood in the middle of the room with a jug of water and poured it on the floor. Voirbo, who had remained calm up to this time, was noticed to show great agitation.

The water flowed over the tiles and settled in pools at certain points owing to the slope and inequalities in the tiling. These points were carefully marked and the water was mopped up. At the places noted the tiles were taken up. Beneath was found coagulated material of a dark colour which was subsequently shown to be blood.

Macé had proved his case by this discovery of direct evidence of a crime. He had assumed that if dismemberment had taken place in that room there must have been considerable effusion of blood. This would naturally soak through the crevices between the tiles at those points where the blood had settled in pools.

It is stated that Voirbo's agitation was so great that he, who had never once betrayed himself, immediately made a full confession of his crime.

This affair is highly instructive from every point of view. It is typical of many others, but it does illustrate in a particularly striking manner the value of

being able to reconstruct from indications more or less insignificant a series of facts which pieced together produce a more or less clear picture of the events. In the first place the black calico seemed to associate a tailor with the crime. The marks on the clothing and the scar on the leg helped to establish identity. It is also worth noting how seriously a mistake in medical evidence may hinder an investigation. Had this not been rectified the mystery would never have been solved.

Most important of all is the reconstruction which related to the commission of the crime itself. The discovery of the matches and the candles in Bodasse's room clarified the evidence as to the actual date of the victim's disappearance. The experiment with the water not only produced material evidence of the crime without digging up the entire floor, but revealed it in such a way as to demonstrate with absolute certainty the incidents which had taken place in the room. Part of the circumstances necessarily accompanying the crime was re-enacted, substituting water for blood. It is not difficult to see the significance of this. Had the whole floor been dug up, valuable evidence would have been destroyed for ever. It would not then have been possible to demonstrate that the places where the blood had been found did in fact correspond with those points where pools would have formed. It is an example of scientific demonstration and proof ; a production of and verification by experimental evidence.

Nor must it be forgotten that this reconstruction was of the mixed type. The case is among the earliest

recorded in which this method was deliberately and formally adopted. It was certainly the final link in the chain of evidence without which the matter could not have been cleared up.

There are innumerable instances in which a sound reconstruction is absolutely essential. Examples where there is doubt as to whether the affair is one of murder or suicide are the most obvious. There is a recorded instance of a man found hanged. It was thought he had committed suicide until the method adopted was reconstructed. The man hung with his feet eighteen inches from the ground. *There was no chair or stool anywhere near him.* The rope was fastened to the branch of a chandelier. In making his report the investigating officer had already written the word suicide. Suddenly he began to reconstruct the events. It immediately occurred to him that it was impossible for the man to have hanged himself in this way. This appears to be elementary, but such a consideration is very easily overlooked.

The explanation was a very unusual one. The man, who was old, had died of apoplexy. His two servants who were in charge of him had both left the house. Returning and finding him dead they were afraid of blame for their neglect. It was they who fitted the rope, placed the noose round the old man's neck and left him hanging so as to suggest that he had committed suicide. As to why by this subterfuge they hoped to escape the charge of neglect is not explained.

In case of knife wounds and shooting a reconstruction is always necessary. It has to be considered if the bullet wound or wounds, for instance, could

possibly have been self-inflicted, and if not whence they were fired, from what distance, whether the aggressor was right- or left-handed ; whether the wound was immediately fatal. The last point is often vital. In any number of instances it may be necessary to decide whether the wounded person could or could not have done certain things.

Such examples strengthen the case for the necessity of a sound reconstruction which the Voirbo case so admirably illustrates. Scientific instruments and expert diagnosis make possible increasingly precise technique of reconstruction. It is a necessary part of the study of any modern crime concerning which there is an element of doubt.

TRACES AND STAINS

CHAPTER V

FINGERPRINTS

THE history of fingerprints and skinprints generally has two separate aspects. They might be called the anthropological and the criminological. The curious ridges and channels upon our fingers had been noted long before the individual uniqueness of their character was even dreamt of.

In 1686, for instance, Marcello Malpighi has noticed them: "*Extremum digiti lustro apicem et innumeras illas rugas quasi in gyrum vel in spiras ductas contemplor.*"

With "*gyrum*" and "*spiras*" he uses two words very reminiscent of the modern bureau of identification. But there is no suggestion that either he or any of his contemporaries supposed that the design of these markings was individually unique. The subject arises again from time to time, in 1747 and 1751, but there is nothing more than observation of the papillary markings and general allusions to their design.

In 1819, however, a most remarkable piece of research was carried out by a medical man named Jean-Evangeliste Purkinje. He not only observed the papillary ridges and their design, but classified them in a manner not unlike the modern one. Even to Dr. Purkinje the idea had not occurred, however,

that these markings might be a means of identification. His work in any case remained unfinished so that it is difficult to say if its motive was merely scientific curiosity or whether he had formulated some theory, but it seems clear that he had no practical application in mind.

These are matters of fact, the earlier history of fingerprints, so far as there can be said to be any, rests largely upon surmise.

It used to be fashionable to attribute to the ancient Chinese civilization all the discoveries proper to our own and a good many others besides. A great deal in the history of the Chinese goes to show that they had a civilization quite as advanced as our own. But there is nothing to suggest that its evolution was along the same lines, or that the machinery of it, administrative or industrial, was comparable with that of the West ; while there was a good deal, on the other hand, which goes to show that it was not.

Not without some evidence, however, it has been suggested that fingerprints as a means of identification were a discovery of the Chinese. That they recorded fingerprints there is no doubt, with what exact motive is not easy to ascertain.

A large number of Chinese documents are extant upon which impressions of fingerprints occur. Dr. Locard, who has examined some of these, finds that they do not show any clear reproduction of the papillary markings, and he draws the conclusion that they were not placed there for the purposes of ordinary identification. It is more probable that they were added as a sign of confirmation of the promise of the

parties to honour the terms of the contract whatever they were.

There is evidence on the other hand that at a much later period (the thirteenth century of the West) the Chinese had observed the papillary markings and described them. That they employed fingerprints in criminal procedure in the manner that we do is by no means so certain, but there are some indications which seem to connect the Chinese criminal with sets of fingerprints.

This part of the history might be described as the anthropological. The criminological aspect of the question which revolutionized the whole technique of identity did not come to the fore until 1886 when Sir Francis Galton began his epoch-making investigations.

The discovery itself, which Purkinje himself had been within an ace of, was actually made about 1856. It was an event in scientific history and one attended with some very curious coincidences. Sir William Herschel, a commissioner in Bengal, caused the natives to affix to documents marks of their fingerprints. This was originally done to ensure that the provisions of such documents should be honoured. Sir William indeed was employing that which was probably the ancient Chinese custom of solemn ratification by placing the fingers upon the paper and permanently recording the act.

A similar custom even survives in England. The small seals at the end of a document against the signatures are a relic of the practice of placing the finger upon them with the words "This is my act and deed."

About 1858 a very large number of these impressions had been collected. Hershel, by a careful examination of them, came to the conclusion that they would serve as a means of identification. In 1877 he was sufficiently convinced of it to apply semi-officially for permission to use this method for the identification of prisoners and accused persons.

But even at this time the enormous importance of this discovery does not seem to have been recognized. It was not until 1880 when Henry Faulds, an English physician, attached to the Tsukiji Hospital in Tokio, made his famous communication to *Nature* on the 28th of October, that the matter began to receive world-wide attention.

The object of his researches had not been criminological at all. He had been studying the fingerprints upon Japanese prehistoric pottery and discussing them from an anthropological point of view. In the letter to *Nature*, however, he did point out the probable uses of fingerprints in criminal investigation. Faulds indicated that he had actually identified a fingerprint found upon a glass which had contained brandy.

As a result of this correspondence Faulds and Hershel were soon in touch with each other. The scientific spirit is not puffed up, knows no jealousy, and takes no part in the vulgar scramble for notoriety. Hershel claimed no priority for his discovery but pointed out to Faulds that he had in fact employed this method in Bengal for a considerable time. The interchange of information and the co-operation of these two great men led to a rapid development of the science of identification by fingerprints.

There is a sense in which it is true that Sir Francis Galton was the real discoverer of the technique of identification by fingerprints. He had at his disposal the work of Hershel and Faulds which he developed and systemized in a way which illustrated its immense value and did much to convince the sceptical of its superiority over other systems of identification.

A curious historical sidelight appeared in 1929, when Heindl published a work in the *Archiv fur Kriminologie* by an investigator named Eber. This, written in 1888, was not published; but it included much which had been discovered by the better-known investigators, and would have been of first-rate importance if it had appeared at the time.

The discoveries relating to the utility of fingerprints and those regarding the methods of classifying them are really quite distinct. If this had been clearly recognized much of the controversy concerning priority would have been avoided.

In 1909 there was a great deal of correspondence in *The Times* on this subject.

George Darwin in an article on the subject of fingerprints claimed that Galton was the discoverer of the method of identification. The public had generally believed that Sir Edward Henry, successor to Hershel, was the initiator, and a lively controversy followed. The claims of Hershel, Henry, and Galton were argued, and it was even suggested that Purkinje ought to be considered.

The facts seem to be that Hershel was the first discoverer, but that he did not realize in full the extent to which fingerprints could be employed for the pur-

poses of identification. They were independently discovered by Dr. Faulds who, while recognizing their value from a criminological point of view, did not develop the implications of the discovery to much greater an extent than Hershel.

Galton, on the other hand, besides being a medical man and an anthropologist, was an able statistician. He collected and classified an immense amount of evidence regarding fingerprints. The possibility that fingerprints might be not only a means of identification but a unique badge of identity by which every individual could be infallibly distinguished from every other was probably first conceived by him.

Sir Edward Henry's classification, no less monumental a work, was carried out with a different motive. He recognized that if fingerprints were to be of any use a means must be found of laying hands upon any particular specimen with as little delay as possible. His method of classification makes it possible for a service of identity to produce in a few minutes from among many hundreds of thousands of fingerprints the required specimen, or to assert that no example of the suspected print is on record.

That this could be done from the first is clear from the eloquent testimony of Arthur Carey, late Deputy-Chief of the Homicide Bureau, New York. In his book *On the Track of Murder* he remarks that the then Chief Inspector of Detectives being sceptical about the new system sent the fingerprints of a notorious English thief, then in prison in New York, to the Scotland Yard experts. No name nor indication as to the criminal's identity was supplied.

In a month a reply was received stating that they were those of English Harry, a house-breaker. This was, as it were, to supply correct information by return of post. It was as a result of this test that the system was introduced in America.

No invidious distinctions ought to be made in the matter of the discovery of fingerprints. Purkinje, Huschke, and Kolliker were among early investigators who drew attention to the subject. Hershel and Faulds were the pioneers of the modern technique. Galton did much to prove the unique character of individual impressions. Henry put the system itself on a practical basis. Every one of these investigators deserves his niche in the completed structure.

For the structure is by no means completed yet. Juan Vucetich, Francisco Latzina, to mention but two, have done important work in classification. Edmond Locard and Miranda Pinto, as we shall see, are making fingerprint history. Many other systems of classification—each with something to recommend them—besides Henry's are in existence. Different countries and even in some cases different towns have their own usage.

Up to now fingerprints have been considered from the point of view of the detective. That of the criminal is also interesting.

It is not an exaggeration to assert that this discovery produced a veritable panic in the criminal ranks. The recidivist in particular understood its implications and possibilities very well, and the contemplation of them made him very uncomfortable. The system's greatest advantage was, and is, that once a criminal

has been in the hands of the police there is a record of it which no disguise, no facial or bodily changes due to age or accident, except the loss of all the fingers, can efface.

The result, of course, has been an endeavour on the part of all criminals not to leave prints upon the scene of their crime. The obvious precaution of wearing gloves has been adopted, but there are circumstances in which gloves are not always a protection as some very interesting cases later to be considered show. Attempts have often been made by criminals to efface the papillary markings so as to avoid an impression of them being recorded. The fingers have been scrubbed with sandpaper until they were completely smooth. This expedient, however, and even others more drastic are of no avail. The ridge markings reappear in a very short space of time and in design and number always correspond exactly to the original configuration. The ridges are in fact practically indestructible.

There are exceptions to this. The design on the first and third fingers of the right hand of the present writer is, in places, almost obliterated owing to a frost bite. Although this accident occurred in 1931, and on one finger there is no scar, the ridge markings do not appear to be resuming their originally well-defined form.

But it is true of fingerprint identification as of other branches of scientific criminology that advances in scientific knowledge do not benefit the forces of law and order alone. The observations of different countries differ as to the extent to which criminals

take precautions to protect their fingers, but it is true in general that fingerprints are not so commonly found as they used to be. More than this, there seems to be evidence that false fingerprints have, in one or two cases, been left on the scene of a crime which might have resulted in the arrest of innocent persons. These are questions with which modern technique is closely concerned, and we shall presently consider how the scientific detective deals with them.

It goes almost without saying that the fingerprint system did not win recognition at once even among those who were best able to judge of its merits. In 1893 Alphonse Bertillon wrote as follows of Galton and Henry's system: "*Malgre les ingenieuses recherches de M. Francis Galton en Angleterre, ces dessins ne presentent pas des elements de variabilité suffisamment decisifs pour servir de base a un repertoire de plusieurs centaines de milliers de cas.*" But with the fair-mindedness which characterized this great French detective he consented to incorporate with the statistics of his own "anthropometric measurements" a record of the fingerprints of the individual whom they were supposed to identify. He ultimately became convinced of the unique value of the fingerprint system.

Bertillon, however, was easier to convince than judges and juries. Although fingerprint evidence was in use before that time one of the earliest recorded instances of the acceptance of fingerprint evidence in a court of law was in 1902. This was a burglary which took place at Denmark Hill. The house-breaker had left an impression of his right thumb on the window-

pane. Agreement between this impression and that of the accused's thumb was established. He seems to have been convicted largely on this evidence.

It is an interesting fact that the earliest example of a conviction on the evidence of a fingerprint took place in the Argentine in 1892. A murderer named Francisca Rojas was convicted upon this evidence. The system made an immense impression upon the police and judicial authorities of several of the South American States almost as soon as it became known, and it is further true that South American experts have made many important contributions to the science of fingerprint identification. Greece, on the other hand, has the doubtful distinction of only one conviction by means of fingerprints to her credit; and that not until 1928!

Although the system has been in use in England since about 1893, its actual acceptance as sole evidence of guilt in a court of law was not admitted until much later, and is not always admitted even now.

In the case of *Rex v. Chadwick*, tried in Birmingham on the 19th of October, 1908, before Bigham J., the judge invited the jury not to accept the fingerprint evidence. The circumstances were that a burglary had been committed and that impressions of the accused's fingers had been found upon a champagne bottle. The prints were sufficiently well defined for the police to demonstrate twelve points of resemblance between the fingerprints of Chadwick, the accused, and those upon the bottle. The learned judge was not himself satisfied with this, and invited the jury to accept his opinion. They, however, found the prisoner guilty.

More commonly, it is the jury who have regarded the evidence as unsatisfactory.

On June 30th, 1909, some correspondence appeared in *The Times* relating to the supposed fallibility of fingerprint evidence. It was not faultlessly accurate since the remarkable assertion was made that Bertillon was the inventor of the fingerprint system.

The case which inspired the correspondence was that of Francis Lawler, accused of the theft of jewellery and money. The police sought to show that Lawler was a recidivist who had been in Portland in 1896 and more recently in Brixton Prison. Inspector Munro, who was in charge of the case, stated in evidence that there was no doubt as to the identity of the fingerprints of Lawler alias Clark. The accused in evidence denied that he was Clark or that he had ever been in prison. The jury apparently believed him and he received a lighter sentence than he would have done had the police evidence that he was a recidivist been accepted.

In connexion with this case Sir Edward Henry communicated with *The Times*. He pointed out that the jury had rejected the fingerprint evidence because they did not understand it. There was in his opinion no doubt at all as to the identity of the fingerprints which were confirmed by photographs of the prisoner which were in the hands of the police. Sir Edward added that he was of the opinion that the evidence had convinced the judge.

The Stratton case of 1905 also proves that the evidence of fingerprints was not at this period thought to be absolutely conclusive. This example is regarded

as a classic instance, but although the accused were both convicted of murder and executed, the judge warned the jury not to convict upon this evidence alone. A point made by the defence is also of interest as indicating the quality of argument which was thought likely to appeal to juries at that time. In his speech for the defence learned counsel said that the fingerprint evidence ought to be rejected because scientific testimony was not acceptable to English minds. The verdict of guilty pronounced by the jury may have been an index to their inability to appreciate this rather questionable compliment.

Confidence in this kind of evidence, however, rapidly grew, and from about 1912 onwards it was accepted, at least in theory, as being infallible provided always that the imprints themselves were sufficiently well marked to make a definite opinion possible. Difficulties have not infrequently arisen in this connexion. The police laboratories of Europe and Scotland Yard all possess thoroughly trustworthy experts who can be relied upon to give testimony in which every confidence can be placed. Fingerprints are an admirable example of the reliance which is now placed upon expert evidence which in practice has proved to be reliable.

But cases arise where the evidence is rejected. One in fact occurred in January 1932, when James Cranny, a labourer, was charged with breaking and entering a timber merchant's office at Bootle and stealing a cash-box containing £3 2s. 6d. The evidence against him was one fingerprint on the cash-box which was said to be identical with that of Cranny's. The accused was acquitted.

Perfect fingerprints are infallible evidence, but it is the exception and not the rule to find perfect fingerprints on the scene of a crime. A smudged fingerprint is, of course, useless for the purpose of identification, and one which is fragmentary has value as evidence in direct proportion to the area which can be examined ; the greater the fragment, the greater the possibility of identifying it. It is necessary to establish a certain number of points of resemblance or the evidence is useless. The greater the number of points of resemblance the greater are the chances of identity.

Very few people realize, however, how great the actual figures are. The eminent criminalist, Baltazard, has applied a simple formula which is expressed thus :

$$\frac{1}{4^n}$$

This means to say that to find 2 points of resemblance in two fingerprints 16 would have to be examined. But the figures increase enormously with the number of points of resemblance required. Thus for 8 points of resemblance 65,536 prints would have to be examined ; for 12 points of resemblance 16,777,216, while for 17 points of resemblance 17,179,869,184 would have to be examined.

It will at once be clear that with, say, twelve to fifteen points of resemblance the possibility of error is entirely out of court.

In all countries it is recognized that in ordinary circumstances, remote though the chances are, with

less than twelve points of resemblance it is unsafe to assume identity. It is in this sense only that fingerprint evidence can be said not to be infallible.

Some of the special circumstances are very interesting. Bertillon has shown that in the case of brothers and sisters and particularly twins, the fingerprints at certain points apparently in bifurcations show general resemblances. But they are only general. In the case, however, of close relations, a larger number of points of resemblance might be required in some cases than in the comparison of unrelated fingers.

It is in these directions that the modern history of fingerprints is developing. The twelve points of resemblance have to be established, and modern methods can identify impressions which would have presented difficulties some years ago.

It is a curious coincidence that when the sixth edition of Wills *Circumstantial Evidence* appeared in 1912 the learned author there drew attention to the illustration of enlarged fingerprints on page 201. Sir Alfred Wills alludes to the spots which represent the sweat pores, and states quite correctly, at least as far as Great Britain was concerned, that no attention was paid to them with regard to identification.

At this very time, however, Edmond Locard was developing the Poroscopic method in his laboratory at Lyons.

Painstaking research has shown conclusively that the sweat pores, microscopic openings lying along the ridges, vary in number and position with each individual. There seems to be no question that in the case of the sweat pores alone, an examination of their

number and position will ensure identity with no greater and perhaps less chance of error than in the case of the papillary markings.

It is impossible to exaggerate the importance of this new discovery. In the first place markings made by other parts of the hand than the finger-tips can now be identified. Secondly, an imperfect imprint in which an insufficient number of characteristic papillary markings are present can be examined poroscopically and an additional number of points of resemblance shown.

The method was first used in Lyons in 1912, when it resulted in the conviction of two housebreakers named Boudet and Simonin. In this affair both ordinary fingerprint identification and the poroscopic method were used. Both the accused were found guilty and condemned to five years *travaux forcés*.

In other cases criminals who have taken the precaution to envelop their fingers before handling objects which would record impression have yet left palm-prints capable of identification with the poroscope. This method is indeed essential for identifications of this kind since the ridges on the palm of the hand are not generally sufficiently characteristic for identification. The pores, wherever found, invariably are.

Even the shape of the individual pores when sufficiently highly magnified are seen to be characteristic so that each one of these is to some extent a help to identification.

With the poroscope as with fingerprints, judges and juries were at first not too ready to accept its evidence, further proof if any were required that what may

appear to be and is in fact irrefutable to the expert, may be rejected by the layman because he cannot understand it.

This, however, is not always true.

Dr. Locard has informed us that on one occasion he was retained to give expert evidence relating to a certain fingerprint as to the identity of which he had entirely satisfied himself. The proof, however, involved explanations of a technical character which he feared the jury, one composed of honest but extremely slow-witted countrymen, would not be able to follow. He explained as best he could and as simply as possible the method of proof by counting the pores, and the calculation dealing with the probability of error. He scanned the faces of the jury; it was obvious that they had not understood a single word. It appeared also obvious that they would certainly not return a verdict in accordance with evidence they had not understood.

The jury retired.

What was his stupefaction when they returned in an exceptionally short space of time with a verdict of guilty. The verdict had depended upon a proper understanding of the scientific evidence. It was in his view undoubtedly the correct verdict, but he could not understand how the jury had arrived at it.

He was soon to learn. In the place outside the Court he met one of the jury who clapped him on the shoulder :

“ Eh bien, docteur ! On a voulu vous montrer qu'on n'était pas plus bête ici que dans les grandes villes ! ”

This blind and unreflecting confidence, he tells us, disturbed him not a little as well it might. But for his own scientific conviction upon the point, it might have disturbed him a great deal more. This is one of the major problems of scientific evidence. It is the expert's duty to make the jury understand the point at issue if he can, for an additional and immense responsibility devolves upon him if he cannot.

Some very remarkable experiments were carried out by Stockis in 1912 relating to the impressions made by gloved hands. This investigator discovered that if the finger was inked in the same way as when an impression of the print is to be taken for identification purposes and a glove of thin rubber or skin is put on, there are circumstances in which the gloved fingers will leave an impression. The same was found to be true in the case of the fingers being very greasy when thin gloves were worn.

This accounts for the occasional but very remarkable cases in which it seems to have been established quite definitely that fingerprints have been left even when gloves have been worn.

Of these the most striking example is one of a robbery which took place in the November of 1919 in the rue Bat-d'Argent, Lyons. Fingerprints were discovered upon a piece of glass from a broken window. These were developed with lead carbonate, a fine white powder. It was evident from the nature of the impression that it had been made by a finger carrying a glove, probably of thin wool. The impression of the material appeared, but there was to be noticed also the marks of the ridges. These were sufficiently clear

to be compared with the police records in the Bureau of Identification and were traced to a Maurice Reynaud, a recidivist. He had left for Paris but information was telegraphed to the Sûreté and he was arrested at the Gare de Lyon.

The stolen property was found upon him, and his guilt was established without question.

These cases are rare, but this one is not unique. It is often, of course, very difficult to establish with certainty that gloves have actually been worn even when the circumstances seem to indicate that they must have been. In this instance there appears to be no doubt as to the facts since the impression of the material was noted with the fingerprint, as it were, superimposed. The phenomenon can be explained by the fact that the fatty acid which the perspiration of the fingers exuded will pass through thin material and thus record an impression.

It is only modern methods of developing and examining fingerprints which has made it possible to utilize faint impressions of this kind since it is obvious that fingerprints recorded under such conditions cannot be as clear as those produced in normal circumstances. This is additional evidence of how modern scientific technique is extending the scope of criminal investigation.

During the last two years some remarkable observations have been made by Dr. Miranda Pinto in connexion with the fingerprints of apes. It used to be thought that the papillary marking of apes were without exception much more rudimentary than those of human beings. This is generally true, but

there are exceptions which make Dr. Pinto's conclusions rather disturbing reading.

He has shown that some chimpanzees record fingerprints which are indistinguishable from those of man. Dr. Pinto has produced excellent examples both of arcs and loops of a form quite definitely human. The example of a fingerprint of one particular chimpanzee agreed in a certain number of points with that of a boy of a degenerate and criminal type whose fingerprints were preserved in the Bureau of Identification. The general appearance of the two impressions was startlingly alike.

There are certain cases in which evidence of this kind might have an important bearing upon a criminal inquiry. In an investigation to be quoted later, a monkey was actually employed, trained to assist in burglary. In an affair in which an ape might figure it is obvious that if the fingerprints left were of the human type, and Pinto's observations had never been made, false conclusions might be drawn detrimental to the course of justice.

Among the cases included in the *Return of Sherlock Holmes* appears the strange affair of the Norwood Builder. Those who have read the story will recall that a thumbprint in blood was discovered by the police on the wall of the hall. This corresponded to the thumb of McFarlane, the accused man.

It is a fact to be borne in mind that Sir Arthur Conan Doyle was immensely well informed in forensic matters, and that many of the strangest of his stories are founded upon fact. In this affair, however, the police, who on the whole do not shine beside their

brilliant amateur rival, handled the investigation with an incompetence altogether incredible.

Inspector Lestrade on his own admission took a wax impression of McFarlane's thumb in order to compare it with the bloodstained impression found on the wall. No police officer, even an incompetent one, would have done this. It is true that the case is supposed to have occurred in the early 'nineties, but even then more was known about the comparison of fingerprints than that.

This detective story hinges upon the fabrication of a fingerprint. What is supposed to have occurred is that McFarlane had impressed his thumb upon a piece of warm sealing wax when closing a letter in the presence of his uncle, who bore him a grudge. The uncle after the departure of the young man late at night had staged a murder and a fire in a wood yard attached to his house where the body was to appear to have been burnt. He had then hidden himself to complete the illusion of murder.

That the evidence might appear more damning, he had fabricated the blood-stained thumbprint in the following manner. An impression in wax was taken from the sealing wax which carried the young man's thumbprint. The cast was smeared with blood and pressed on the wall.

This is admirable except for the disadvantage that a thumbprint could not have been fabricated in this manner. But from an historical point of view the story is of great interest. It is founded upon fact. Attempts seem to have been made to fabricate fingerprints on one or two occasions.

Some cases quoted are founded much less securely in fact than the *Case of the Norwood Builder*. Among them is the fantastic anecdote that certain Parisian robbers were accustomed to leave on the foreheads of their victims a bloodstained fingerprint corresponding to one of M. Lepine, Prefect of the Paris Police. It should not be necessary to deny so absurd a rumour except for the fact that it gained such currency as to be quoted seriously and in perfectly good faith in a criminological journal of standing. Dr. Locard's exposure of this absurdity is accordingly repeated here.

Examples apparently genuine, however, exist. It would be undesirable to discuss the methods employed for reproducing a fingerprint for obvious reasons, but several laboratory methods have been evolved by which it is possible to fabricate the papillary markings in such a way as to make their falsity extremely difficult to detect. It suffices to say that they do not resemble the method quoted in the *Case of the Norwood Builder*.¹ A wax impression of this kind would not produce a print capable of deceiving any observer with the slightest knowledge of the subject. A case will be quoted in the next chapter, however, which is difficult to explain except on the hypothesis that at least one of the prints studied in connexion with the affair was not genuine.

This brief account of the development of fingerprint identification indicates how important and

¹ *The Devouring Fire*, by Lord Gorell, also turns upon a false fingerprint. This, however, is only one part of its startling and unexpected climax.

eventful has been its short history. That the history of fingerprints is shorter than that of any other branch of criminal investigation is its most remarkable feature. At a generous estimate the longest period that can be assigned to it is a hundred and eleven years, and for practical purposes it does not exceed fifty. Other branches of criminal investigation can lay claim to much greater antiquity. The examination of footprints, toxicology, and even bloodstains have a longer history. The detection of forgery also received attention long before the discovery of fingerprints. But in spite of this there is no branch of scientific investigation which has attained a higher degree of proficiency.

Its unique value accounts for this. A single bloodstain or footprint, a weapon or other article found on the scene of a crime, can seldom be sufficient evidence on which to convict. A single fingerprint can and very often has proved to be irrefutable evidence of guilt. If the print is of a type by which identity can be established no other evidence is necessary.

As we have seen, the development of the science has largely depended upon this consideration, how to make the most of fingerprint evidence. The house-breaker is seldom accommodating enough to leave fingerprints behind him of an order in which a hundred or so points of resemblance can easily be demonstrated. But a fingerprint which perhaps thirty years ago would only yield six points of resemblance may, when examined by the more refined methods of to-day, reveal many more. The means of developing fingerprints with powders, and of revealing latent impressions upon paper with chemical reagents have

been greatly improved. Since the facility with which a print can be examined depends largely upon the method of developing it, it is clear that a great deal hangs upon efficiency in this direction.

The science of photography has been more and more employed in the service of fingerprint technique. Fingerprints specially illuminated can be photographed just as they are found without development, and sometimes in such a way that as sharp a representation is recorded as if a coloured or white powder has been used to develop them.

Photomicrography by which highly enlarged photographs of fingerprints are made available has been of immense service to the science. Without it Locard's poroscopic method could never have been evolved. The value of photomicrography can best be shown by this illustration. In a photomicrograph a square millimetre, which is a very small area, may show a sufficient number of pores satisfactorily to establish identity. This means to say that however insignificant the fragment of a fingerprint found, provided that any square millimetre is perfect, identity can be established. This is certainly theoretically true, although for practical purposes a trace of only a square millimetre would not be utilized. It is intended to illustrate, however, the immense number of points of resemblance that photomicrography can reveal. In the palm print of Simonin—the case already quoted—for example, 2,000 identical pores were demonstrated as between the print found on the scene of the crime and the impression of the material part of the palm of the accused.

The researches of Dr. Pinto are really part of a much wider series of observations which include those relating to traces made by other types of animals besides monkeys. The paws of most animals show characteristic markings which can often be clearly identified. There is as yet no satisfactory evidence that they are permanent in design as in the case of human subjects. But all the observations go to show that the paws of dogs, cats, and some other animals are sufficiently distinctive in many cases to be identified.

Circumstances arise where animals and the traces they leave may have an important bearing in a criminal case ; so that these investigations far from being of merely theoretical interest have a strong practical bias.

It seems as if the science of fingerprint identification has for all practical purposes been perfected. Yet prophecies of this kind are rash. The perfection of to-day may be but a pale shadow of the perfection of to-morrow.

CHAPTER VI

CURIOUS FINGERPRINT CASES

PERHAPS one of the most remarkable affairs relating to identification by this method was that in which the criminal, instead of leaving his fingerprint on the scene of the crime, left his finger.

This incident occurred in 1909.

A constable on his rounds had his attention attracted by an object which was sticking upon one of the spikes of a pair of high folding doors which guarded the entrance to a warehouse. On closer examination it proved to be a human finger. The constable immediately detached it from the spike and forwarded it at once through the local police station to Scotland Yard. There an impression was taken of it, and it was immediately identified. Scotland Yard communicated the name of the owner to the local police station and the man was arrested. He was a recidivist with a very bad record named Mitchell. The case was perfectly clear since there was the confirmatory evidence of the missing finger. Mitchell in the early morning had attempted to climb the gates and enter the warehouse. When nearing the top he had slipped, and his finger had been torn off.

Gruesome though this example is, there could hardly be a better one of the efficiency of the fingerprint system. There is no definite record of the time which

elapsed between the policeman's giving the particulars, but it probably was not more than an hour and a half. The crime occurred near the centre of London which made it possible for the finger to be delivered at Scotland Yard in a very short time.

Speed is an essential feature with this kind of evidence. An average time for dealing with such a matter is about two hours. The fingerprint is discovered, developed, and photographed if necessary, and particulars of it wired to the appropriate bureau of identification. The methods of recording the thousands of fingerprints in any given bureau are such that in an incredibly short space of time the required information is available.

The following account is an excellent example of the initiative and resource necessary to deal with special cases which arise from time to time. A police laboratory is not always concerned with carrying out routine operations. Problems are frequently submitted to it which are to be solved there and then if the author of the crime is to be discovered. Some technical point will, of course, be at issue; some method has to be evolved which will meet the needs of the special case when the application of routine methods would be useless. And worse than useless. A criminal exhibit holding some invisible clue must be dealt with in the right way, for a mistake may mean the loss of the clue itself. Experiments cannot always be performed twice.

The affair in question occurred in Belgium in 1905.

A double sheet of common paper was submitted to the laboratory for examination. It was alleged to be

a note written by a particularly dangerous anarchist to a colleague, and as such was intercepted by the police who desired to be assured as to the authorship.

The paper was handed over to the chemical expert, M. Jorissen, who found upon it a number of yellow stains which after micro-chemical examination he pronounced to be of potassium ferrocyanide. He accordingly proceeded to treat the paper with a solution of iron chloride which produces an intense blue colour with potassium ferrocyanide. As a result of this treatment what had appeared to be yellow stains turned out to be a number of fingerprints which showed up very clearly in dark blue against the paler tint of the paper. There were two series: one set which seemed from their disposition to belong to the same hand while the other consisted of numerous isolated prints, probably of different origin.

Experiments were tried with a view to deciding if the prints were made by fingers which had been in contact with potassium ferrocyanide, or if the fingers had been free from it and had been pressed on the paper which itself was impregnated with this chemical.

This was all tried out in practice. Pieces of paper moistened with drops of a solution of potassium ferrocyanide and dried were pressed with the fingers. In the other case, the fingers were dipped in potassium ferrocyanide and applied to the paper. It was found that the more distinct impression corresponding in colour more or less to paper under examination were produced by the second method. The conclusion drawn was that it was possible that the stains were made by fingers which had been wet with the solution,

not that the chemical had been on the paper at a prior time.

The developed prints were clear enough, but great difficulty was experienced in photographing them. Blue is actinic and thus very difficult to photograph, and the difficulty was increased by the fact that the paper was also blue so that there was insufficient contrast on the photograph. Coloured screens were tried without result, and then orthochromatic plates with no greater success.

It was then decided to make an attempt to change the blue colour to some other which would provide greater photographic contrast.

Further experiments were tried with the application of the vapour of a strongly ammoniacal solution of ammonium sulphide to paper treated in the same way as the suspected document had been treated.

By this means a considerable darkening of the fingerprints was brought about. The tint was fugitive, but it was found possible to photograph it and enlarge the photograph six times without too much loss of detail. Although they were by no means perfect the photographs were sufficiently sharp to establish twenty points of resemblance with the fingerprints of a suspect, L. The print of the right thumb was the one by which identification was established.

L. confessed to being the author of the note. He also admitted that he had been using potassium ferrocyanide as a reagent in the manufacture of an explosive bomb.

This is one example of resourcefulness. It is not every day that the laboratory will have to deal with

fingerprints made with such a reagent as potassium ferrocyanide. The chemist, as a matter of fact, did not choose the most satisfactory method. As Stockis and Conn, who report this case, remark, the use of a copper salt would have coloured the print brown and thus made them easier to photograph, but the chemist did not know that he would find anything that would need to be photographed. He performed a difficult task with great success. Though he must have had many anxious moments, all is well that ends well.

It is not frequently that animals play a part in crime ; but they have been trained to do many odd things, and none more so perhaps than a dog, the property of a London shoeblick, who was taught by his master to run on muddy days across the path of well-dressed pedestrians in such a way as to foul their boots with mud. The shoeblick is said to have made an excellent living by this ingenious expedient.

This example is scarcely criminal, but there are cases on record where animals have definitely been trained to take part in crime.

The jewel robberies which took place in the Count de Commercy's flat and in other places had certain aspects which are probably unique in the history of crime. Some of the affairs had sensational features which it is not relevant to consider here, but on the scene of more than one of these crimes fingerprints of an unusual type were discovered which very much puzzled the police who first examined them. The impressions, of which transferred specimens were submitted to the laboratory, proved to be those of

an ape. This piece of information did not at first much assist the investigators since, although it was assumed that the monkey was in some way concerned in the robbery, the circumstances were such that he could not actually have committed it. A safe had been broken and jewellery and other valuables abstracted from it. It is an interesting fact that the presence of the ape in the room was confirmed by the discovery of certain lice not generally associated with human beings even of the lowest type.

The victims of the robberies had all been drugged, and it was while they were under the influence of this drug that the robberies were committed. This was a constant feature in all the cases. By a process of elimination the conclusion was arrived at that it was in this drugging that the monkey had played a part. Nothing on the face of it would have seemed to have been more improbable, but in this case, as in many others, it was a question of eliminating all the impossible solutions and examining what remained.

Except for this curious feature the case was not remarkably mysterious, and beyond the fact that one member of the gang was murdered by another, a woman, as the result of some dispute, and an attempt made to incriminate another girl who had nothing to do with the affair, the police had no particular difficulty in clearing the matter up.

An interesting point, however, arose in regard to the knife with which the murder was committed. No fingerprints were found upon it. The nature of the wound suggested that it had been thrown. The handle was decorated with small studs by which it



By permission of Dr. Ed. Locard.

THE FINGERPRINT OF A MONKEY, TRAINED TO STEAL, LEFT
ON THE SCENE OF THE CRIME IN A FAMOUS FRENCH CASE.

was supposed that the knife was held, and which left no sufficient evidence of papillary markings. The woman, of Egyptian nationality and a recidivist, was well known to the police, but the accumulation of the necessary evidence against her in connexion with the robberies was a very efficient piece of work.

The ape remains as the most interesting element in the affair from the technical point of view. His fingerprints which showed neither arches, whorls, nor loops, but a few characteristic bifurcations, were checked up against the fingers of the animal. An endeavour was also made to reconstruct the monkey's part in the affair. He was given a bottle full of water, and at the same time a sound was made similar to that which his mistress was supposed to have used on the occasion of the burglaries. As a result the monkey ran towards a bottle of wine standing on the table and poured the water from the bottle he had been given into it.

This very interesting demonstration seemed to suggest that the monkey had been trained to pour the contents of a small bottle given to him into a glass from which the robbers had previously assured themselves the person they wished to drug would drink. The reason for the employment of the monkey was his great agility and the ease with which he could enter an apartment when a human being could not. It was a further advantage of this ingenious method that if the monkey were discovered, he could not very well be arrested and charged !

Allusion was made in the last chapter to the circumstances which really led up to the discovery of

fingerprints as a means of identification : the impression upon documents of the fingers of the parties to the agreement for the purpose of solemn ratification.

A very peculiar criminal case arose in 1927 in Lucknow which recalls, though in a different connexion, this early history. Three Indians, Mahboob Ali, his brother Mahfooz Ali, and another, Muinal Hāq, were accused, tried, and convicted of being concerned together in forging and uttering a will supposed to be that of Rani Barkatunnissa, aunt of the accused Ali, a very wealthy woman, one of the widows of the Rajah Thamsher Bahadur.

The circumstances were that on the day the Rani died, one of the accused, Malifooz Ali, entered the room where the body lay and made a print of the dead woman's thumb on a piece of blank paper and another of that of her servant, who of course was still living, Miss Baghin. He gave as his reason, which seems to have been accepted at the time, that he had to send information of the death to his brothers.

On the following day he tried to get the blank paper attested, but failing to do this he judged it best to attempt to obtain evidence that the Rani was alive and of sound mind on the material dates, April 13th and 14th. He feared that otherwise it might be claimed that the more recent forged will, even if accepted as genuine, might be invalidated by some earlier one on the grounds that the deceased was very ill and not of sound mind.

Miss Baghin, the maid, was accordingly induced to impersonate the deceased for the benefit of an English doctor who knew nothing of the circumstances. Miss

Baghin lay in bed surrounded by heavy curtains, thrust out her arm and hand so that the doctor could take her pulse, and, of course, quite rationally answered his questions. In consequence the doctor gave a certificate that the Rani—whom he imagined the invalid to be—was capable of transacting business.

A bogus will was accordingly drawn up dated April 14th and under the thumbprints of the Rani and her maid. This will was the cause of a family dispute which resulted in an exposure of the forgery.

A mistake made by these very ingenious swindlers was the first cause of suspicion.

The Rani's signature was always made with her left thumb. Her nephews, unfortunately for them, had chosen the right.

Fingerprints are of such immense importance from the point of view of identification that the greatest possible care must be and always is taken where questions of comparison arise. In all cases of identification in all countries an elaborate system of check and counter-check is employed which makes an error almost impossible. When the method was first introduced it was naturally received with some scepticism. Those therefore who had introduced it and who were certain of its infallibility knew that one error would be a more serious setback than anything a thousand successes could do to establish confidence.

Mistakes are very rare, and in criminal cases it might be said that they never occur, but fingerprints are occasionally employed in other than criminal cases, and in circumstances that make errors possible.

For some reason that is not very clear a woman

who had made a deposit of money in a certain bank had in place of, or as well as, signing the necessary papers, left an impression of her left thumb upon one of the documents. The most probable explanation of the peculiar circumstance is that she could not write.

Some years later she wished to withdraw the money and presented herself at the bank for that purpose. An impression of her left thumb was taken, and the clerk at the counter took it away to make the comparison. There was some considerable delay, and the clerk presently returned with the information that payment could not be made since the two impressions did not agree. In spite of her protests the bank remained firm upon this point. As a result of this dispute the two impressions were sent to Police Laboratory at Lyons where they were examined by Dr. Locard.

The two fingerprints both of the "whorl" form were photographed and enlarged. Superficially they appeared alike, but on close examination quite pronounced differences were noticed, particularly in the "pockets," the small core in the centre of the whorls.

It was not until the two photographic plates were superimposed that the mystery was explained. The two prints represented the same fingerprint, but one was "positive" and the other "negative." That is to say that in one specimen the ridges appeared black and the furrows white, while in the other the furrows were black and the ridges white.

This was explained by the manner of recording the fingerprint. The clerk, unaccustomed to such matters,

had applied too much printing ink to the finger before it was pressed on the paper. He had accordingly wiped off the excess with a piece of cloth, but this instead of reducing quantity of ink had driven it into the furrows, leaving the *ridges* without any ink upon them. Accordingly, when the thumb was pressed on the paper the ridges appeared white, but the furrows full of ink marked the paper. The result was a negative print. The other specimen had been recorded correctly, and was as it should be, positive.

Examples of the fabrication of fingerprints are fortunately rare, but it is a somewhat disturbing fact that there seems to be on record at least two or three cases which cannot easily be explained on any other hypothesis. Where fingerprint evidence is available the accused, except in affairs of murder, very often pleads guilty, but where a plea of not guilty is entered and there is no confirmatory evidence, the affair of R. of Copenhagen should be borne in mind.

It may as well be said at once that there is very little doubt that R. was guilty of the crimes of which he was convicted, or at least certainly of one of them. In 1907 he was accused of robbery in Copenhagen, the sole evidence against him being two thumbprints upon a copper box. He denied the charge, and after two months' detention was released. Seven years later he was again arrested, charged with burglary, the evidence again being a thumbprint. On this occasion, however, confirmatory evidence was obtained. A piece of newspaper which had evidently been used to handle a burgling tool was found, and when the rooms of his wife were searched a piece of newspaper

into which this fragment fitted was found in a valise. R. was separated from his wife but was known to have visited her from time to time. The accused was convicted and sentenced to two years' hard labour. On this occasion also R. had pleaded not guilty.

On account of this second accusation and conviction M. Bugge, Chief of the Service of Identity, ordered a reinvestigation of the case of 1907. At this period, July 23rd, 1914, the most remarkable incident in the whole inquiry occurred. A letter purporting to come from a certain painter arrived at the editorial office of one of the newspapers on July 24th with a postmark of July 23rd. This communication was a confession that the writer had committed the burglary of which R. had been accused and for which he had been convicted. A bracelet was enclosed which was part of the stolen property, none of which had been found upon R. at the time of his arrest nor had any of the stolen property ever been traced to him. This, however, was less remarkable than the fingerprints on the letter and those on the newspaper used to wrap the parcel which was a copy of that of July 23rd. They were again thumbprints and those of R., who had been in close confinement on July 23rd and 24th and had received no visitors.

This chain of events is inexplicable on the available facts, but it does seem clear, on such as there are, that the thumbprints on the letter and parcel could not have been those of R.

But if they were fabricated, who fabricated them, and why? If the motive was further to incriminate

R. it seems to have been an extraordinary method to have adopted. And if this was the intention whoever was responsible could not have been aware that R. was in prison, or they would not have impressed representations of his fingerprints on a paper he could not have seen.

The case is one for an enthusiastic amateur detective who will bear in mind the vital fact that R.'s fingerprints were found at all points in the inquiry, and that at one point it seems impossible that he could have made them.

CHAPTER VII

THE TRAIL OF THE CRIMINAL

SO when they were gone forth the king set meates before Bell : nowe Daniell had commanded his servants to bring ashes and these he sifted throughout the temple that the king might see : then went they out, and sparred the doore, sealing it with the king's signet and so departed.

In the night came the priests, with their wives and children, as they were wont to do, and did eate and drinke up all.

In the morning betimes at the breake of the daye, the king arose, and Daniell with him.

And the king sayde, Daniell, are the seales whole yet ? He answered, Yea, O king, they be whole.

Now as soone as hee had opened the doore, the king looked unto the aulter, and cryed with a loude voyce, Greate art thou, O Bel, and with thee is no deceyte.

Then laughed Daniel, and helde the king that he should not go in, and sayde, Behold the pavement, marke well, whose footesteppes are these ?

The king sayde, I see the footesteppes of men, women, and children.

Therefore the king was angry, and tooke the priestes with their wyves and children and they showed him the privy dores where they came in, and did eate up suche things as were upon the aulter.

For the whiche cause the king slue them, and delivered Bell into Daniels power, whiche destroyed him and his temple.

(The Story of Bel and the Dragon which is the XIV Chapter of Daniel after the Latin.) Text of Parker's (the Bishop's) Bible. Folio Edition. 1575.

This is probably by no means the earliest example of the detection of a crime—in this example a type

of confidence trick—by an observation of footprints. But the story is particularly suggestive by reason of the action of Daniel who was clearly a born detective. He “helde the king that he should not go in” and disturb the scene of the crime. And his almost professional caution recalls, in a related connexion, the outburst of Sherlock Holmes :

“Oh, how simple it would all have been had I been here before they came like a herd of buffalo, and wallowed all over it !”¹

There is, all the same, a great deal of difference between the observation of a footprint in connexion with a crime and its identification, and the technique, more or less elaborate, employed to connect it with a particular individual. Some aspects of this problem, however, have been considered from very early times, as for example the identification of running feet by an examination of the imprint, the effect of lameness, and the deeper impressions made by a pregnant woman. Hints and suggestions relating to this type of phenomena are to be found scattered through the literature of many peoples for more than three thousand years.

But we have to advance through a long period in time before anything like scientific evidence in connexion with the examination of footprints is to be found. In the seventeenth century there are examples in which the evidence of footprints was utilized, but the methods employed for measuring and comparing them were not precise. The obvious ones of attempting to fit the suspected footwear to the impression,

¹ *The Boscombe Valley Mystery.*

and possibly rough measurements were no doubt applied frequently enough, but as we shall observe later this method is highly unsatisfactory and has given rise to serious miscarriages of justice.

In the eighteenth century there are definite indications that the importance of precise information on this point was beginning to be recognized ; and having regard to its early date the trial of Richardson for murder in 1787 is remarkable for the precision of its scientific evidence.

In the autumn of 1786 a young woman was found murdered in a cottage in the neighbourhood of Kirkcudbright, a very sparsely populated district in Scotland. Her parents had gone to the harvest field leaving the girl alone and the discovery was made a little after midday when they returned. The girl's throat had been cut in an exceptionally brutal way and the possibility of suicide was ruled out from the first.

From the report of the surgeons who carried out the autopsy it is clear that they were of opinion that the girl's assailant was left-handed. This report itself is significant, for it is more than doubtful if a seventeenth-century surgeon would have considered such an observation of sufficient importance to include in a report, and indeed it is not until towards the latter part of the eighteenth century that anything like a scientific autopsy in a criminal case begins to appear.

In this affair, however, it was the detailed and thorough examination of the footprints which was the determining factor in the trial. From the cottage in

the direction of, and actually across a bog which lay some distance away, a clear impression of footprints was noticed. They appeared to be those of a person who had been running.

At one point the runner had slipped and his foot and part of his leg had sunk into the mud of the bog. It was ascertained by measurement that his leg must have been immersed nearly to the knee. The footprints themselves were carefully measured and impressions—probably in plaster—were taken of them. It was noted that the boots or shoes had been newly mended and were heavily shod with iron nails.

Accompanying the footprints a track of blood drops was discovered and at a stile there was what appeared to be the imprint of a bloodstained hand.

There was no direct evidence of any kind, and no suspicion as to who could have been the author of the crime. The autopsy, however, had revealed the fact that the murdered girl was pregnant, and it was supposed that this might have been the motive of the crime.

A very interesting incident occurred at the funeral which indicated the scrupulous care with which this investigation was conducted. It was thought probable that the murderer would attend the funeral so as to avoid comment which might lead to suspicion if he were absent. After the funeral the steward caused measurements to be made of the footwear of all the men present. The shoes of the schoolmaster of the parish agreed very closely with the measurements of the impressions found near the scene of the crime, but a careful comparison revealed the fact that

while his shoes were pointed those of the impression corresponded to a round-toed shoe.

Investigation was continued and finally a shoe of one of the men present was found to correspond exactly with the measurement and cast of the impression. The shape of the foot, the condition of the sole, and the position of the nails also agreed with the cast.

On being questioned as to his movements on the day of the murder, the wearer of the shoes, a man named Richardson, replied that he had been employed all that day at his usual occupation. His fellow-workers confirmed this statement, and as a result the inquiry was dropped for the time being as far as he was concerned. A little later, however, suspicion was for some reason re-aroused and Richardson was apprehended.

The suspect admitted that he was left-handed and accounted for some scratches noticed on his cheek by the statement that he had got them in a wood where he had been gathering nuts. He continued to declare that he had been at work during the material time on the day of the murder.

A strict examination of this alibi was made.

It was discovered in consequence that he had been absent from work for half an hour about midday and it was established that at this time a person resembling him had been seen in the neighbourhood of the cottage. This evidence agreed with that of his fellow-workers who now remembered that he had been absent from work for about half an hour in the forenoon of that day.

The exact circumstances were that he had been driving a cart which contained also his two companions. In the neighbourhood of the cottage he had stopped and asked them to mind the horse while he went to the smith's shop. He returned in about half an hour, a longer period than they had expected him to be absent, and excused himself saying that he had been in the wood gathering nuts. They then noticed that his stockings were wet and dirty. On being questioned about this Richardson admitted having stepped in a marsh.

An examination of the stockings which were found hidden in the thatch of the cottage where he lived constituted the second part of this very interesting investigation. Blood was found upon them. But more important than this it was reported that the mud and sand with which they were impregnated corresponded with the mud found in a puddle near to the cottage where the murder took place. According to the evidence this mud possessed unusual characteristics not associated with any other mud in the surrounding district.

At the trial this evidence was accepted as a matter of fact, but whether the method of examining it could at that time have established this positively is open to very grave doubt. A lens might have been used to observe the sand, but no chemical examination upon which any reliance could be placed could have been made at that time.

The evidence against the accused was very strong. It was proved that he had been intimate with the girl who was pregnant by him, and fear of the im-

pending scandal was the motive for the murder suggested by the prosecution. The evidence of the footprints was quite conclusive, and Richardson's alibi was proved to be unsound. He was convicted and before his execution confessed his guilt and confirmed it by giving information regarding the place where the knife with which he committed the murder could be found.

This affair is probably the earliest in which methods thoroughly scientific in principle were applied to the examination of footprints. The investigation of the mud on the stockings is also highly suggestive of the enlightened point of view of the investigation in this case. Whatever shortcomings it may have had, the very fact that it took place indicates that those engaged in the investigation were alive to the importance of such clues as these.

We shall observe that neither then nor for a long time afterwards was a matter of this kind usually followed up with so much care and attention to detail and that the results in not a few cases were disastrous.

Although not entirely the fault of the investigators one such was the case of François Mayenc. This man was accused of attempted murder during the first quarter of the nineteenth century. The evidence against him was identification by the person he was supposed to have attacked and that of footprints which were proved to correspond with those made by his shoes. Beyond the assertion that he was innocent Mayenc put forward practically no evidence in his defence. He was found guilty, and sentenced the galleys for life.

It transpired later that the father and not the son was guilty. An angry conversation took place when the elder man went to see his son. This aroused suspicion and the father was interrogated. As a result he confessed to having committed the crime. He had worn his son's shoes presumably with the intention of incriminating him when he had gone out to shoot the complainant. Suspicion had fallen upon the younger man for this reason.

Even thirty-five to forty years later the importance of the proper examination of footprints was not universally recognized, nor was the technique for identifying them standardized.

The example of the Garesio murders is one in point. This horrible series of outrages took place in Turin in 1862, the period being one of political instability in Italy which made crime and especially highway robbery a profitable and not too hazardous an occupation. In all cases the throats of the victims were cut and the bodies left robbed of all they had possessed. A young detective named Domenica Cappa investigated the last of these crimes, the murder of a carter whose body had been left in a ditch. Cappa took careful measurement of all the footprints he found, and made reproductions of them by the very crude method of pressing newspaper over the impression and cutting it out along the edges corresponding to the edges of the impression. His measurements, however, were based upon sound principles and it seems curious that so methodical a worker should have adopted so clumsy an expedient for the purposes of reproduction. The method of casting in plaster of

paris or other material was certainly known if it was not commonly practised in Italy at that time. There is evidence that even his methods were not usually employed since Cappa was much laughed at for pains which his colleagues seemed to regard as waste of time.

His trouble, however, ultimately resulted in the conviction of the criminals. He deduced from the prints that two men were concerned in the crime. One was large and tall and a countryman since there were nails in his boots ; the other was small and shod in the fashion of a town dweller.

A chance remark incautiously dropped by one of the murderers when he was in liquor and, by good fortune, overheard by Cappa first directed suspicion to Gian Battista and Antonio Garesio.

These men were ultimately arrested upon some more or less trivial charge with the object of making measurements of their boots. It was established that there was substantial agreement between the measurements of the sets of prints and the actual boots. Ample confirmatory evidence was collected and the two Garesios were tried, found guilty, and executed.

There are many respects in which the technique employed in this affair does not compare favourably with the Richardson case of 1787. Although the nails were observed by Cappa he does not seem to have recorded their position by making a cast. This was done in the earlier investigation, the conduct of which was, however, altogether exceptional having regard to the early date of the case.

The history of the examination of footprints is a

strange one. It does not develop normally, but shows quite inexplicable variations from period to period and even from case to case. A comparison of the Richardson affair and the Garesio murders seventy-five years later is an example. But it is not the only one.

In June of 1860 occurred the murder of Francis Savile Kent, the four-year-old child of Samuel Savile Kent, in mysterious circumstances that neither the police investigations nor the Coroner's Inquisition did anything to clear up.

It was first handled—and very inefficiently handled—by the local police.

The child's body was found wrapped in a blanket with his throat cut on the morning of June 30th in a disused outhouse thirty yards from the house. The only conclusion of any value that the police drew was one so glaringly obvious as to make any alternative theory impossible. They formed the opinion that someone living in the house must have committed the crime.

It was evident from an examination of the house that the guilty person had entered the drawing-room and opened the window of that room, so that it seemed probable that he or she must have passed through the window to gain access to the garden. It was reported, however, that no footprints were found either on the carpet of the room nor upon the earth below the window, nor in any place about the garden or the outhouse.

Two medical men examined without result a certain nightdress which, it subsequently transpired, had

two small stains upon it which washing had not entirely removed. This trifle in itself speaks significantly for the manner in which the whole investigation was conducted.

Matters stood thus at the inquest, a most unsatisfactory inquiry, and a verdict of wilful murder against some person or persons unknown was returned. There was further a magisterial inquiry which resulted in the arrest of the nurse to the Kent household, Gough, against whom there was not a tittle of evidence. The girl was released almost immediately.

Detective Inspector Whicher of Scotland Yard ultimately took charge of the case at a period afterwards when any clues which might have been available had certainly disappeared from the scene of the crime.

The only one left upon which he could work was the very curious fact that of three nightdresses belonging to Constance Kent, elder sister of the murdered child, only two could be found. The girl swore that one of them had been lost in the wash, a statement which did not satisfy this astute detective. He connected it with another odd fact. The two doctors, Dr. Parsons and Mr. Foley, had originally examined three nightdresses. But the one the girl wore and had still placed in the wash-basket looked quite clean. This fact had been remarked, but for some reason, quite impossible to explain, was not followed up.

By Detective Inspector Whicher's direction Constance Kent was apprehended and committed to Devizes gaol.

The evidence against her was the detective's theory that the nightdress she wore on the night of the

murder was put by her into the laundry-basket, but that for some reason, probably to re-examine it for any suspicious marks, the girl had removed it, replacing it by another—the clean one she had put on after committing the murder—while the actual examination of the premises was in progress.

Whicher fought hard for an adjournment at the inquiry at which Constance Kent was charged. Not only did he fail to obtain one, but he was severely censured by the magistrate for his conduct of the whole matter. Constance Kent was released.

As a result of this alleged blunder he was obliged to retire from the case. Shortly afterwards he resigned from the service and died, it is said, of a broken heart.

Samuel Kent, the father, was then arrested, but in turn was released for lack of evidence.

The conclusion of this remarkable affair was the dramatic confession of Constance Kent five years later. She made both a confession and a statement; and a plea of guilty was entered at the trial. The girl was commended to mercy and received a sentence of penal servitude for life.

It is her statement with which we are here concerned. Some days before the crime, which was premeditated and carefully planned, she secreted one of her father's razors and some matches and a candle in the closet at the bottom of the garden.

On the night of the murder she went to bed as usual and a little after midnight when the house was quiet Constance Kent got up and went to the nursery. Taking a blanket the girl wrapped the child in it and

went downstairs to the drawing-room. She had previously visited this room to open the door and the shutters so as not to have to put the child down. Entering the drawing-room with the child she slipped into goloshes, went to the window, opened it, holding the child in one arm, and passed out by the window and so round the house to the closet. There the murder was committed and the child afterwards placed in the outhouse.

Constance Kent returned the way she came, went to her bedroom, and carefully examined her night-dress. There were two spots of blood upon it. She washed them out with water, took it off, and put on another. She had intended apparently to send the soiled nightdress to the wash but upon examining it in the morning found that the stains were still faintly visible. It was by this time dry but she dare not rewash it, so that the girl placed the clean night-dress in the wash-basket and secreted the other, realizing that although the two doctors had examined it once they might do so again, and more minutely.

Detective Whicher had been correct in his every surmise.

We are, however, more immediately concerned with the question of the footprints.

Having regard to the movements of the girl on her own admission, the distance she had passed over and the varying nature of the ground, it is perhaps just possible that there were no footprints, but it is in the highest degree improbable.

Seeing that the investigators originally missed or failed to follow up anything that was of any impor-

tance, that they made two arrests on no evidence at all, and that they seemed to have suspected every adult member of the household in turn except the right one, it is not unreasonable to accept their assertion that there were no footprints with a great deal of reserve.

An equally serious miscarriage of justice in the opposite sense occurred in 1875. A William Hebron or Habron was accused in that year of the murder of a police constable in Manchester.

This officer, named Cock, had originally charged the two brothers with drunkenness of which William received the benefit of a certain doubt on the question of identification. He was heard to threaten the police constable as he left the court.

That night the constable was murdered in the neighbourhood of West Point. He was not killed instantly but he was able to make no coherent statement. Superintendent Bent, however, who had overheard the threat, seems at once to have formed the opinion that William Habron had fired the shot.

An examination of the ground revealed a number of footprints. The boots of the Habrons were secured and apparently compared with the traces found by fitting them to the impressions. The police evidence given at the trial was to the effect that the boots of the suspects fitted them exactly. This method is very unreliable, and there seems to be no doubt that the presupposition in the minds of the police unconsciously influenced their evidence.

The case against the brothers was strengthened by reason of the fact that the alibi with which they en-

deavoured to meet the accusation was proved to be false. This further prejudiced the jury. William Habron was at any rate found guilty and convicted, the sentence being penal servitude. John Habron was acquitted.

Some years afterwards Charles Peace when under sentence of death confessed to the murder of Police Constable Cock. The case was in consequence reopened and the facts investigated. As a result William Habron was pardoned and received compensation of £800.

This unfortunate affair indicates how dangerous circumstantial evidence can be when approach is made to it with a prejudiced mind. But the defect was really in the technique which produced the circumstantial evidence itself. It was not fully realized even at that time that the comparison of an imprint with the boot which was supposed to have made it was of all methods of comparison the most unsound. It has since been shown that an impression never corresponds exactly with the footwear making it.

The most extraordinary methods have been adopted for the preservation of such traces. It was seriously contended at one time that the only satisfactory method was to dig the footprint up whenever this was possible. As a matter of fact, it is very seldom possible. In the process itself the impression will almost certainly be distorted, and even if it is not, it will hardly survive transport.

All kinds of not very felicitous experiments have been made with substances to produce moulds : glue, stearine, and even breadcrumbs and suet. For all

purposes plaster of paris is the only one giving really satisfactory results, and if a mould cannot be made with plaster of paris, it will probably be impossible to make a mould of the footprint at all.

This is the modern practice. After measurement and photography a mould is taken in plaster of paris. Measurements if properly carried out are sufficient to establish identity but for the purposes of demonstration moulds are very useful.

In one of the most extraordinary trials which ever took place in England, plaster casts alleged to be those of the accused were produced. This was in 1879. A burglary had taken place in Edlingham Rectory. On the night of the 7th of February, Mr. Buckle, the vicar, and his wife heard suspicious sounds after they had retired to bed, and Mr. Buckle's daughter gave an alarm at 1.30 a.m. Her father, although an old man of seventy-seven, armed himself with a sword and courageously went down to prevent the burglary. He discovered two men removing his valuables, one of whom made his escape while the other fired at the vicar seriously wounding him.

The police suspected two poachers named Michael Brannagan and Peter Murphy. These men were stopped at seven o'clock in the morning and searched, but since nothing incriminating was found upon them they were then released, but kept under surveillance.

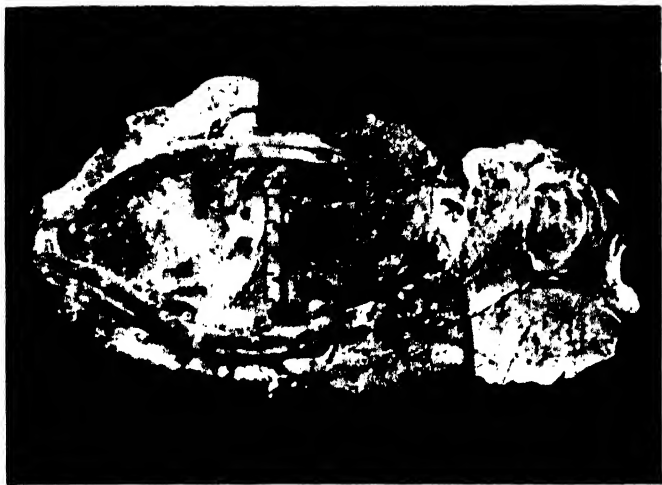
An incident which was to have great significance at the trial occurred when Murphy returned to his lodging. A girl to whom he was engaged, fearing that he might be re-examined, went through his pockets and in one found some rabbit's fur and blood. She

hastily tore the pocket out and hid the coat. Very shortly afterwards the police returned and asked for Murphy's clothes. The girl surrendered them but replaced the jacket with one belonging to a man named Redpath, Murphy's brother-in-law, who could have had nothing to do with the crime in any case.

The men were rearrested and taken to the police station where they were stripped. No sword wound of any kind was found on their bodies, nor any cut in their clothes which such a weapon might make. Neither Mr. Buckle nor his daughter were able to identify the men.

There seems to be very little doubt that even if the police believed these men to be guilty evidence was manufactured against them. It was suggested by counsel for the defence that the plaster casts of the footprints which were said to correspond with those of Brannagan and Murphy had been deliberately faked, or in the alternative, if this had not been done, that the prints found did not agree with those made by the clogs of the accused. This was an excellent point for an advocate. The print made with an iron-shod clog is very easily confused with that of another of the same size. The characteristic points may be only minute and might therefore require methods to identify them more delicate than were available at that time. It appeared that a large number of people, many of them probably also shod with clogs, had passed over the ground before the police had examined it.

Much more serious was the question of the alleged clue of the fragment of newspaper. This fragment



PLASTER CASTS OF LANCASHIRE CLOG PRINTS

Identification of such prints may be very difficult.

was, according to the police, found in Murphy's coat, and it fitted exactly into a piece of newspaper found on the scene of the crime. But although the police did not know it, this coat was not Murphy's coat at all ; it belonged to Redpath. It is impossible to escape the conclusion that it must have been placed there. No suggestion was made that Redpath had anything to do with the burglary.

There was further a piece of cloth with a button upon it put in as evidence. This fitted a hole torn in Brannagan's trousers. A tailor giving expert evidence expressed the view that it could not have been torn out in the manner it was, in the circumstances it was suggested by the prosecution it must have been. The cloth was moreover clean, a fact which did not square with the conditions under which it had been found.

Both these pieces of evidence were also open to the objection that they were not put in at the preliminary inquiry, but seem to have been produced when it was known that certain facts damaging to the prosecution had come to light.

The judge, however, summed up against the accused on both the charges of burglary and wounding with intent. He proceeded, after a verdict of guilty had been returned, to pass the heaviest sentence in his power, penal servitude for life.

Seven years later, quite by chance, a man named George Edgell came to be questioned in regard to his movements on the night of the crime. He ultimately confessed to having committed the burglary and implicated a man named Richardson, his accom-

plice. As a result the original verdict was quashed, and Brannagan and Murphy released and compensated. Edgell and Richardson were tried and convicted.

An ugly rumour got abroad that Superintendent Harkes, who had been in charge of the original case but who had some time afterwards died, had admitted that he knew the police were wrong, but that the mistake could not be rectified.

Superintendent Butcher of Scotland Yard was accordingly detailed to make an investigation. As a result of the report of this able and experienced officer, a prosecution of the police engaged in the original case was ordered. They were accused of making false plaster casts of footprints and of feloniously placing a piece of paper in the lining of a jacket believed by them to be Murphy's.

Mr. Justice Denman found that there was not evidence of deliberate conspiracy and the accused were found not guilty.

This verdict is extremely difficult to square with the facts. There is not much doubt that the police sincerely believed that these unfortunate men had committed the crime, but evidence against them seems clearly to have been manufactured.

In regard to the plaster casts of the footprints, this might have been a genuine mistake. But there is not much doubt that here the wish was father to the thought, and that any piece of evidence unfavourable to the accused was eagerly seized upon by the police.

As many successful investigations show, however,

it was about this period (1880) that the examination of footprints became so very useful an aid to detection. An investigation described by Thienard has many particularly interesting points about it. But for one mistake, it is a very perfect demonstration of scientific detection.

In the May of 1881 a man was discovered dead with his head mutilated, at Lignere. The motive of the murder seems to have been robbery of the provisions which the man was carrying in two pannier baskets. Close to where he lay was a field boundary of wooden stakes and wire. The investigators noticed that one of these stakes had been uprooted. Near the base of it was a footprint, and it was noticed that the heel-mark was much more deeply marked than the toe. It seemed probable that the assassin had dragged up the stake to use it as a weapon ; and this deep heel-mark testified eloquently to the force he had had to use.

This was not all. The boot was a nailed boot and had left a print of a large nail of unusual and quite characteristic shape.

Instead of making a plaster cast there and then, the police for some reason elected to dig up the print and take it in a box to the *juge d'instruction* at Saint-Amand. There a plaster cast was taken of it. It is not clear for what reason this was done, but it was in the days before the existence of laboratories of technical police, who to-day would themselves have been on the scene of the crime. This particular imprint, however, seems to have survived transport and a good plaster cast was taken. The police of Touchay

and the district surrounding Lignere were notified and a sharp lookout was kept for possible suspects.

A police guard on the following Sunday noticed a young man whom he regarded as a suspicious character leaving the church. He followed him and closely observed the impression made by his boots on a piece of soft ground he passed over. The guard at once identified this nail, the young man was arrested, and his footwear seized. A cast was taken from his boots which agreed minutely with the traces found. The accused confessed and was condemned to penal servitude for life. The shape of that one nail had been sufficient to convict him.

As time goes on there is a tendency to rely not so much upon the general form of the print but upon the characteristic details so much more important for the purposes of exact identification. Originally this was not sufficiently refined to bring out the minute detail which can now be reproduced. It is possible in fact to make casts of impressions in sand, mud, dust, and snow with great precision.

Dr. Locard, in commenting upon the burglary committed by Sherlock Holmes and Watson in the case of Charles Augustus Milverton, remarks that the eminent detective could not have made a worse choice of footwear than the rubber-soled tennis shoes that he and his trustworthy but egregious assistant wore for this escapade. This is quite true. Even the fine marking upon a tennis shoe can be faithfully reproduced in the contemporary plaster cast, and the characteristic manner in which the tiny studlike markings have worn can be studied.

An illustration of this is to be found in a case quoted by the eminent director of the laboratories of technical police at Lyons himself.

An alleged burglary had been committed at the quai Saint-Antoine at Lyons. Two footprints were discovered, one on the balcony outside the window and one on a broken piece of glass which had fallen inside the room. One of the assistants of the laboratory, M. Chevassus, examined the traces. The complainant had declared that these must have been made by the thief. He himself, however, possessed a pair of rubber shoes. The suspected traces corresponded exactly with those made by the shoes of the complainant !

In 1930 occurred one of the most interesting questions of identification which has ever arisen in the case of a footprint. The impression was discovered on a piece of waxed paper such as is used to pack carbon paper for typewriting purposes.

The imprint was produced by a shoe soled with crêpe rubber. It was possible to show that a part of it had been worn by the pressure of the foot on a bicycle pedal which had imparted its pattern to the rubber sole. The examination of the imprint not only showed the wear due to the pressure of the pedal but also that produced on another part of it by walking. The effect of these activities were in definite contrast which was quite clearly discernible and was found to agree exactly in all points with the impression made by the suspected shoe.

These examples did not involve making a cast of the footprint. But it is now possible not only to

examine deep impressions in soft material but faint traces in dust upon furniture, upon polished floors, or upon paper of any kind. In these cases even where the impression is very faint special photographic methods can be used to make them sufficiently distinct for the purposes of identification.

This is a brief outline of the history of footprints. Beginning with crude methods of comparison, rough measurements and application of the suspected footwear to the impression, the method of taking a cast and inspection of outstanding details followed. Casting has become a fine art which reveals all that there is to reveal. Finally it can safely be said that now no impression of naked foot, boot, or shoe, however faint, is likely to escape the vigilance of the scientific police.

CHAPTER VIII

THE HISTORY OF THE BLOODSTAIN

THE famous physician, Harvey, discovered the circulation of the blood about the middle of the seventeenth century, and made a brilliant demonstration of his theories before Charles II. What sort of conception must the earliest physicians have had regarding the nature and function of the blood? They probably supposed that the body held blood in much the same way that a tank holds water, and that when the body was damaged it flowed out after that manner. It is in any case clear that they could have had no inkling of the true nature and function of the blood at all. Some precursors had, as a matter of fact, very hesitatingly suggested a theory similar in principle to Harvey's, but they had not demonstrated its mechanical nature, and no suggestion that it obeyed mechanical laws seems to have occurred to them. Its corpuscular structure and composition were not known even to Harvey.

The history of the bloodstain from a medico-legal point of view does not begin until very much later. As far as bloodstains upon the scene of a crime, upon the clothing of the victim or a suspect, or upon a weapon were concerned, the layman knew what the medical man knew, and that was not very much. From the angle of experience the layman often knew

more. Crimes involving the shedding of blood were more common then than they are now. Where scientific knowledge is wanting experience is the only guide, so that it is not uncommon to find in early trials relating to crimes of violence that laymen gave evidence with regard to the appearance of suspicious stains. William Batson's evidence in the Godfrey affair already quoted is an example of this. It was very vague, and it was calculated to mislead the court, but there is no reason to believe that it was not honest. Until bloodstains actually came to be studied from the medico-legal angle it was not generally realized, because it had not been observed, that they are not necessarily red but according to their age and other circumstances they may appear black, greenish brown, pink, and in some cases even almost colourless. It is interesting to compare this last fact with Batson's evidence when he spoke of a large stain of "whitish blood." This, while it does not establish his testimony as being necessarily trustworthy, does suggest that he may have known as a matter of experience that bloodstains varied in tint.

Until the advent of high-power microscopy during the first part of the nineteenth century the corpuscular structure of blood was not known, and it was not until later that any attempt was made to identify it by microscopical examination, or in any other way.

But the immense importance of bloodstains in criminal investigation, and the desirability of establishing their precise nature and origin was recognized as soon as biochemistry began to be applied to the detection of crime. Judicial experience of the past

may have had much to do with this. The evidence of bloodstained clothing has almost in itself been accepted as evidence of guilt.

In 1721 a girl named Catherine Shaw and her father lived in a tenement flat in Edinburgh. They were known to be on bad terms owing to a dispute regarding Catherine's association with a man whom the father disliked. Shaw was known to have used violence to his daughter very frequently, and there were continual quarrels.

In the October or November of that year the tenement neighbours testified to an unusually violent dispute between the father and the girl. This ended in loud groans followed by sounds suggesting that someone had left the flat and gone out. Becoming nervous several of the neighbours went to the door of the Shaws' flat and knocked. Receiving no reply, they sent for the police, who on arrival found it necessary to break open the door. The body of Catherine Shaw was discovered lying in a pool of blood with a knife beside it. She was still alive and was apparently questioned regarding the quarrel between her father and herself. The girl could not speak, but by nodding her head admitted that a quarrel had taken place and that her father was responsible for her terrible injuries.

On his return William Shaw was taken into the presence of the body. He turned pale, and appeared extremely nervous. It was further noted that there was blood on his hands and clothing. He was apprehended and committed for trial.

The defence was that the girl had committed suicide. Shaw admitted the quarrel, but declared that he had

gone out without even striking his daughter much less murdering her. The blood on his clothing he said was his own. He had been bled a day or two previously and the bandage had become untied, thus staining his hands and shirt.

He was convicted largely upon the evidence of his bloodstained clothing, and the words spoken by the girl, and overheard, during the last quarrel, "Cruel father, thou art the cause of my death." This unfortunate man was executed in the November of 1721, protesting his innocence to the last.

And he was innocent, in fact. A letter was discovered by the next tenant slipped into an opening near the chimney. It was sworn to be in the handwriting of the dead girl who declared in it that she had committed suicide owing to the refusal of her father to consent to her marriage with the man she loved. The letter concluded with a protestation that her father had thus caused her death.

This letter came into the hands of the authorities who, satisfied as to its authenticity, ordered that the body which still hung in chains should be taken down and decently buried. Semi-military honours were rather oddly added to the ceremony.

Of this affair it should be said at once that there was great remissness on the part of the police in not making a complete examination of the room. Although not immediately evident the letter was not hidden, and it ought to have been discovered. The bloodstained clothing, however, is the real point at issue. To-day, a biological examination of it would be made which might have established whether the blood on

his clothing could have been that of the accused, as he asserted, and might have shown that it was not the blood of his daughter. On such evidence he would have been acquitted.

A failure or inability to examine blood upon suspected weapons has often hampered the course of justice. The Rupprecht affair, commonly called the mystery of Big and Little Schmidt, a case recorded by the eminent jurist Feuerbach, is one in question.

In this affair, which occurred in 1817, a moneylender named Rupprecht was brutally murdered on the doorstep of a low tavern in Munich in the most extraordinary circumstances. He was spending the evening in the tavern when the landlord, returning from the cellar, passed the street door and heard a voice from the street asking for the moneylender. The landlord went upstairs to give Rupprecht the message, and the moneylender went down to the inn door. Almost immediately there was a cry and groans, and the company on going down to see what was the matter found Rupprecht dying on the doorstep with a deep wound on his head. He was not unconscious and spoke, exclaiming, "The axe! The axe!"

Questioned as to who had committed the crime he replied, "Schmidt," and in reply to a further question, "Schmidt the woodcutter." He declared he had been on bad terms with a woodcutter of this name—an extremely common one in Bavaria—and shortly after making this statement he died. Suspicion was directed towards three Schmidt brothers, known to be bad characters; two of these brothers were known as Big and Little Schmidt. All three were arrested

and taken before the examining magistrate. Of these the third Schmidt seemed most likely to be implicated. He appeared much agitated when confronted with the corpse, and he was unable to give any satisfactory account of his movements at the time of the crime. Further, he possessed a hatchet.

An examination was made of this, but the only clue it seems to have yielded were spots of what was declared to be blood on the shaft. The blade either was not examined, or no blood was found upon it.

Schmidt in any case was able to give fairly satisfactory explanations to the police. The stain was that of his own blood from his right hand which was chapped. He was able to put forward some sort of an alibi, and further the landlord declared that the voice he had heard asking for Rupprecht was not Schmidt's. This was not very satisfactory and it is certain that to-day a very much more careful examination would have been made for stains on the suspected weapon.

The strongest point in Schmidt's favour, however, was the appearance of the wound. Its length was greater than the axe and suggested rather an injury from a sabre.

This caused the police to turn their inquiries in the direction of some troopers in the neighbourhood, one of whom in particular was known to have owed Rupprecht money which he could not repay. In this regard there was a serious omission. The sabre blades of the troopers were not examined for blood or, at any rate, they were not examined at once.

Suspicion fell upon others including the deceased's

daughter. No case against her could be sustained. The evidence was of the most flimsy, resting as it did merely upon the words of the dying man who had exclaimed during one part of his not very coherent statement, "My daughter, my daughter!"

Here is a case where a single bloodstain, however insignificant, upon a weapon, upon clothing, or under the fingernails of a suspect might have proved a deciding factor in clearing up the mystery. There seems to be no doubt that a thorough examination of the axe was not made, and that no examination of other suspected weapons was made at all. This does not show that there was carelessness in the investigation. On the contrary, the police seem to have taken great pains to arrive at the truth. The conclusion is rather that even if more evidence of bloodstains had been collected, it could not have been utilized to the extent it would be now.

Taylor in his classical *Principles and Practice of Medical Jurisprudence* has shown that in about 1840 blood had begun to be examined from a medico-legal point of view, since he quotes the case of some French investigators who claimed that by mixing blood of different kinds with sulphuric acid it was possible to decide from the odour of the mixture whether the blood was that of a man or a woman, or that of any particular animal. This claim was quite absurd, but it is historically significant as indicating that the medico-legal importance of arriving at such decisions was recognized at that time.

In 1851 evidence was given in Victoria, Australia, at a murder trial regarding bloodstains upon certain

garments, a coat and a waistcoat found in an outhouse. These had belonged to a wealthy stockholder of whose murder two shepherds were accused. It was of great importance to decide if the stains were of human origin since the accused declared that the blood was that of a sheep which had been slaughtered in the outhouse.

Expert evidence was given to the effect that the blood was human blood, and the court apparently accepted it. At this time chemical tests for blood of quite a delicate kind had been discovered. What is known as the Haemin Test was probably used. In the examination a minute fragment of salt is added to the blood (Teichmann's method) on a microscopic slide which is gently heated until dry. A drop of acetic acid is then added and the slide is again warmed. Microscopic crystals of haemin are formed of a characteristic shape. Theoretically, these vary in size and shape with different animals, those produced from human blood being characteristic; but the test is by no means reliable. The size and shape of the crystals depend to a great extent upon the age and condition of the bloodstain and the exact method of performing the test.

In this instance the confirmatory evidence of guilt was ample, but if the experts for the prosecution positively asserted that the blood was human blood they did so upon evidence which was not absolutely conclusive. But another method was available at this time with which they may have attempted to confirm their results. It was known then, as everyone is now aware, that blood consists of red and white

corpuscles known as erythrocytes and leucocytes. These can be measured under the microscope and they do in fact vary in size with different animals, the corpuscles of the elephant being the largest and those of the musk deer the smallest. In terms of microscopic measurement there is a great deal of difference, human blood corpuscles being of the order of $\frac{1}{2500}$ of an inch, those of a sheep being $\frac{1}{1000}$ of an inch. But here again it is necessary that the blood should be fresh or the corpuscle cannot be examined and measured so as to give precise information as to its origin.

A very interesting case quoted by Wills arose in this connexion in 1857. A man named Nation was on trial for murder at the Taunton Assizes. It was alleged that he had cut his victim's throat. A knife was produced and it was not disputed that the stains upon it were those of blood. The accused, however, maintained that the bloodstains were produced by raw beef which the knife had been used to cut.

An expert witness rebutted this assertion by stating that the blood had not coagulated until it was on the knife, so that it must have been plunged into living blood and that its origin was not animal but human. He explained that this was decided by microscopic measurement of the corpuscles. Those of an ox were stated to be $\frac{1}{2500}$ of an inch, those of a sheep $\frac{1}{1000}$ of an inch, of a pig $\frac{1}{1000}$; while human corpuscles were of the order of $\frac{1}{2500}$ figures which, by the way, were not correct, and which in the case of the ox were grossly inaccurate.

He was approximately correct, however, regarding

human corpuscle measurement, and there is not much doubt that he correctly identified the stain. But it is difficult to understand his positive assertion that the knife had been plunged into living blood. It is quite true that there would be a profound difference between blood from the flesh of an animal dead for two or three days and that from a subject killed on the spot. But had the knife been plunged into flesh quite recently dead great caution would be necessary in making a decision. His pronouncement that an examination of the corpuscles could decide definitely if the knife had been plunged into living blood was unjustified.

This was more or less the opinion of the learned judge, Cockburn, L.C.J. While admitting the great interest of the scientific evidence he advised the jury not to convict the prisoner on that testimony alone. Nation was, as a matter of fact, convicted, but there was confirmatory evidence of a very damaging kind.

Matters stood thus until the end of the nineteenth century. If an accused person chose to assert that a suspicious bloodstain upon their clothing or elsewhere was not human but animal blood it was not possible, but in exceptional circumstances, to prove that they were not telling the truth. Evidence, as we have seen, regarding the origin of blood was sometimes given, but it was seldom if ever accepted without confirmation from other sources of information. On the whole, courts of law were perfectly correct in accepting it with caution. At that time no satisfactory method had been discovered of distinguishing human from animal blood.



SECTION OF KNIFE-BLADE WITH STAINS. IS
IT BLOOD?



PHOTOMICROGRAPH OF STAIN. IT IS NOT BLOOD,
BUT VEGETABLE DEBRIS. ORIGIN OF THE
STAIN PROBABLY FRUIT JUICE.

In 1895 an epoch-making discovery was made by Bordet. He found that by injecting the blood of one animal into another, the serum from the blood of the injected animal gave a precipitate with the blood of the animal from which the blood used for the injection had been taken. This discovery at once solved the problem of deciding the origin of a bloodstain. If human blood is injected into a rabbit and after a lapse of a week or so the rabbit is bled and the serum separated from the blood, that serum will make a solution of the suspected blood dissolved in saline (solution of salt in water) turbid if it is human blood, but it will have no effect upon any other. This does not, of course, apply only to human blood. If the rabbit had originally been injected with the blood of a dog, the reaction would take place only with a dog's blood so that serums specific for any animal can be prepared.

Another and apparently simpler modification of the Bordet Reaction has been investigated by Gruber, Bordet, Marz, and Ehrenroot. This consists in adding to human serum small quantities of the suspected blood. If after standing for half an hour to an hour there is agglutination of the red corpuscles, i.e. a red deposit, the blood is of human origin. This method, however, is not employed. It is not so simple as it appears to be, and owing to the formation in some cases of substances known as isoagglutinines it is not absolutely specific in its present form. The more elaborate but sounder method of specific serum is always used in practice.

Bordet's reaction is infallible. But in the case of

the blood of the larger apes a reaction which can be confused with the human reaction by an inexperienced manipulator occurs. Instances, however, where the blood of an ape is likely to be in question are so rare as to make this exception one of no great practical importance.

It was not long before this discovery began to attract attention. In a French case of murder in 1902, the Bordet Reaction was employed to test a bloodstain on clothing which the accused declared was one of rabbit blood. It proved to be human and he was convicted.

An article appeared on the subject in the *Journal of Hygiene* in 1903, but it seems not to have been admitted in an English court until much later. In 1910, however, two murder cases were tried on the 22nd and the 24th October, one at Aylesbury and the other at Chester. These were the Slough murder and the Gorse Hall case.

In the first of these examples the accused, Broome, was convicted. He had brutally murdered an old woman named Wilson, the motive being robbery. A careful search of the clothing worn by him on July 15th, the day of the murder, revealed a small spot of blood on one of his boots. This proved to be human blood. Other articles found in the room where the crime was committed were also marked with human blood.

In the second case no conviction was recorded in what is incidentally one of the strangest mysteries of modern times. On November 1st, 1909, Mr. Storr, the owner of Gorse Hall, hearing a noise came out

of the dining-room and was immediately attacked by a man with a large knife who severely wounded him in several places. He died in a few minutes without making any statement. The assassin was seen in a good light by the victim's wife, his niece, and two servants, all of whom swore to the identity of the accused at the trial, a man named Howard and a relative or connexion of the deceased. He established, however, an unshakable alibi and was acquitted in March, 1910.

A few months later another man, an ex-soldier named Wilde, came under suspicion. It was at this trial in October that the evidence regarding a bloodstain was raised. Sir William, then Dr., Willcoox gave evidence regarding its origin and pronounced it to be one of human blood. Since the tragedy had occurred some time before, the question as to the age of the stain was raised. Dr. Willcoox refused to give any opinion upon this point. It is not possible to tell with any certainty the age of a bloodstain. After a very long period the Bordet test ceases to give any reaction. The way the blood behaves when it is being dissolved in water also gives an indication as to whether it is recent or old, but precise information is never available.

At this second trial the accused was also acquitted. This was largely on the ground of his extraordinary likeness to Howard. The two men were placed side by side and one of the witnesses, a servant who had sworn to Howard's identity at the first trial, was asked if she could distinguish them. She confessed to great uncertainty, and a verdict of not guilty was recorded.

Regarding, however, the evidence as to the bloodstain, it was not disputed that the blood was human ; but its presence was explained by the fact that the accused had fought with another man.

The test is now a recognized part of the expert procedure in trials where the origin of bloodstains is likely to arise. It has been of immense value in a large number of cases in which it might have been very difficult to record a conviction without the information supplied by this test. To quote but one example, it was a very substantial element in the trial of Browne and Kennedy. Spots of blood identified as human were found upon the splashboard of the motor-car stolen from Dr. Lovell's garage by the accused. This associated the car with an act of violence and suggested that the person attacked had been close to it at the time of the outrage. These details were of immense importance in building up the circumstantial case against the accused. In this inquiry also, Dr. Lynch, who gave evidence for the Crown in the matter of the bloodstains, stated in evidence that he could give no indication as to the age of the stains.

Developments in the history of bloodstains have not stopped there. Newspaper statements have recently occasionally appeared in connexion with murder cases which have suggested that in regard to bloodstains found on the scene of the crime or on clothing a test existed by which it was possible to decide not only that the blood was human blood but that it was the blood of a particular individual. It may as well be said at once that no such test exists. If one

were discovered it would be a medico-legal event of the very first importance. But it is sometimes possible to decide if a particular bloodstain is connected with a specified individual.

The Bordet Reaction has been developed in other directions besides that of the differentiation of human and animal blood.

It was discovered in 1900 that human blood falls into four groups according to its agglutination reaction. The test can be applied by using human serum of a known group and mixing it with a saline solution of the bloodstain to be examined. Blood of Group I will agglutinate with both II and III. Blood of Group II only with Group III. On the other hand, blood of Group III will agglutinate only with Group II. Blood of Group IV agglutinates with neither I nor II. Using an appropriate pair of serums it is thus possible to identify the group of an unknown blood.

This test has been a very useful addition to the machinery of scientific detection. It cannot connect a particular bloodstain with a particular individual but it can indicate the probable source of the blood. On the other hand, it may supply irrefutable negative evidence. If, for example, the blood of the victim of a murder belongs to a particular group and a weapon is afterwards found stained with blood belonging to a different group, it is obvious that the police must search elsewhere for the weapon.

But the positive evidence this test supplies is often very useful. On January 26th, 1932, Annette Friedman was attacked in Fore Street in the City with a

razor and killed by a then unknown assailant. Some days later a man named Maurice Freedman was arrested and charged with murder of the girl. An important part of the evidence against Freedman was the discovery of a bloodstained razor on the top of a bus with which it was alleged the murder had been committed. The blood upon this razor was examined by Dr. Roche Lynch, who stated in evidence at the Guildhall Police Court on February 16th that the blood was human blood and that it belonged to Group I. The Home Office analyst further explained that on an average of one hundred persons only about three were in Blood Group I. The blood of the murdered girl was of Group I. This was not, of course, advanced as conclusive proof that the blood on the razor was in fact Annette Friedson's, nor could such a contention have been upheld either inside or outside a court of law ; but in conjunction with other facts it was an additional presumption, not without value, that this razor was, in fact, the weapon with which the crime had been committed.

Biologists and biochemists have by no means abandoned hope of making discoveries which will make it possible to decide the individual origin of blood. Some interesting experiments have been made by Dervieux, an eminent French medico-legist.

He has injected a rabbit with human sperm in which the spermatozoa are still living. Five injections were made in all. At the end of three weeks the rabbit was bled at the carotid artery and the serum collected in the usual way. This serum was found to give a positive reaction with human blood

and also with human sperm, a property not possessed by Bordet's serum. Dervieux has further claimed that this serum gives a more copious precipitate with the blood or sperm of the individual with whom the sperm used for the serum originated, than with other individuals.

If this is in fact the case the discovery is a very important and interesting one. There are difficulties about its application in practice for very obvious reasons. The blood of a person who is dead cannot be tested in this way. But in cases where an accused person had asserted that the blood found upon him was his own, the declaration could be proved or disproved.

And there are other difficulties. The test relies on the copiousness of the precipitate formed. It is not a question of a mixture in one test tube remaining clear while the other becomes turbid. The volume of the deposit has to be considered, and such things are difficult to judge conclusively.

Apart from this there is biological theory. It has yet to be shown that individual metabolism even in this most highly specialized of human functions can differentiate the human species as infallibly as do fingerprints.

A hint was thrown out in Chapter II of how much may hang upon a decision as to the part of the body from which the bloodstain originated. If in the affair of Mary Ashford it could have been shown that the bloodstain on the ground was due to menstrual blood, it is probable that Thornton would never have been tried.

It is sometimes possible to decide a point of this kind. Cellular debris may be discovered under the

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microscope of a characteristic type, and certain micro-organisms of specialized variety. Secondly, menstrual blood does not coagulate, or does not coagulate so easily as blood from other parts of the body. The diagnosis is not easy and must be thoroughly expert. While these indications may and often have made a conclusive opinion possible, their absence does not necessarily negative a conclusion which their presence might assure. This is particularly true in the case of blood from the nose. It is very common for a suspect to account for stains upon his shirt to state that his nose has bled. The presence of certain elements in the bloodstain visible under the microscope such as epithelial cells and small hairs might confirm his statement, but their absence proves nothing one way or the other.

An examination of the nature of a bloodstain is by no means the only indication which is of value in a scientific investigation of such traces. Blood records impressions in some cases with great sharpness. Fingerprints in blood have been a notable feature of many crimes. Perhaps one of the most striking examples of how indications of this kind may escape any but the observation trained to recognize the importance of such things is a case quoted by Hans Gross.

In the Krumpendorf murder the victim was found savagely wounded and covered with blood. No particular importance was attached to this since it was regarded as natural that there should have been a great effusion of blood. Perhaps the very obviousness of this conclusion caused the investigators to take the examination a little too much for granted. That

is the difficulty of the "obvious" crime. It looks on the face of it so remarkably straightforward that a straightforward explanation is assumed from the beginning. Such a point of view may have caused the clue in this affair to be missed until after the post-mortem. This clue turned out to be the most essential of all in clearing up the case.

It was noted that the shirt of the victim had, near the shoulder, a patch of blood of quite characteristic shape. On careful examination the investigators concluded that this patch must have been made by some act of the murderer. Under magnification the patch showed quite clearly the impression of the weave of cloth. From the shape of the patch and from this indication it was assumed that the assassin had knelt on the shoulder of his victim so that the mark of the cloth must correspond to the trousers or breeches he wore when the crime was committed.

A little later a suspect was arrested. No traces of blood were found upon him but there was evidence that a pair of his trousers had been washed. Their weave, however, was found to correspond exactly with the bloodstained impression. This proved to be among the most important pieces of evidence against the prisoner.

Although earlier examples will be quoted later, the possibility of utilizing identifying clues of this type was not realized to any great extent until recently. In the Stepney murder committed by Mullins in 1860 a bloodstained footprint was identified, but the minute examination for impressions in blood is of quite recent origin. They are now photographed with a metric scale so that their exact dimensions are recorded, and

the photographs, if anything characteristic is noted, are enlarged. Bloodstains take impressions well, in some cases almost as well as wax, and for this reason are, of all such traces, of great interest to the investigator.

This seems to be an appropriate opportunity to explain an expression which is much used and not very precisely understood : the reconstruction of the crime.

Criminal investigation is a science, and like other branches of science it rests upon the foundation of experimental evidence. Where any case of identification by means of a trace is concerned the principle will be that an impression of the trace to be identified will be made as far as possible under the same conditions and with the suspected material and a comparison of the two traces made. This is true of fingerprints, footprints, and such traces as have been discussed here. This is quite definitely to test the theory by experiment, to reconstruct the act or acts material to the inquiry.

Another example also relative to bloodstains suggests itself as an even more striking illustration. Hans Gross and other criminalists have explained how significant a story a few drops of blood may tell. Hans Gross illustrates by means of experiment. Blood or a liquid of the same specific gravity and viscosity as blood is placed in a test tube and experiments are tried to show the form and shape of blood drops produced under different circumstances. The drops are made to fall upon a piece of paper. If the blood is dropped from a fair height with the hand held still, a round spot is produced with small radiating splashes. Next a series of drops are allowed to fall while the

experimenter is walking. In this case the splashes are elongated and the small subsidiary splashes are on one side of it. The splash is narrower at one end than at the other, and the narrow end is the pointer indicating the direction in which the wounded person was moving. Thirdly, the quicker the movement, the longer and thinner the splash. It requires very little imagination to realize how immensely valuable information of this kind may be.

There are examples of the general principle of reconstruction. The object is to establish or disprove a theory by endeavouring to reproduce conditions exactly as they are supposed to have occurred and to observe by means of visible experimental indications how far they agree with the observed traces left on the scene of the crime.

This review will make it clear that the examination of bloodstains has played a large and increasing part in the history of criminal investigation. It will have been observed that in early cases the examination of bloodstains supplied no useful information to the investigator at all, but on the contrary may very often have misled him. Until the chemistry of blood began to be understood and a correct diagnosis of a stain was possible blood had no medico-legal importance. And it had very little until it was found possible infallibly to distinguish human from animal blood. The development of the group test has done much towards supplying information as to individuality which if it could be absolutely established in criminal cases would prove a final triumph of discovery in this domain of medico-legal science. While there is no sufficient evidence that we are much closer to a real solution

of this problem, so much has been achieved in the last thirty years that such a development cannot be ruled as being out of court.

The discoveries made have been particularly striking on account of their great practical importance. It would be very difficult statistically to calculate the increase in efficiency of criminal investigation which has resulted from the increased knowledge of the nature and properties of blood. Distinctions made as between the value of purely scientific evidence and that of the work of the ordinary police are invidious and nearly always misleading. Criminals are not convicted upon this piece of evidence or that, but upon the accumulated information built up and fitted together in the course of an inquiry.

But it is true to say that many guilty men might have gone free if the nature of the stains found upon their person, or upon weapons could not have been certainly identified, and that had this technique been available in earlier investigations there are some who might not have suffered for crimes they never committed. In the quoted case of Catherine Shaw, the group test might have acquitted the father. The blood groups of a father and daughter or father and son are not necessarily alike. Had they in this instance been different, the nature of the blood on Shaw's clothing if it corresponded with his own would have gone a long way to establish his innocence. On the other hand, the Rupprecht murder is but one among a large number of other instances where a closer examination of suspected weapons might have cleared the mystery up.

FORGERY

CHAPTER IX

EARLY PROBLEMS

FORGERY is in the higher category of crime, and with the possible exception of really large-scale swindling probably requires the greatest intelligence and the most expert knowledge. From an historical point of view it is important to bear in mind that while the methods available to the forger are very much the same now as they were two hundred years ago, methods of detecting him have recently been greatly improved. By reason of the improvements in machinery, skill in handicraft has not greatly increased. It has not declined as some would have us believe, but the art of handwriting has actually degenerated. Methods of printing, although mechanically greatly improved, are not in quality a great deal ahead of the typography of two hundred years ago.

Facility with his hands and with his pen, a knowledge of the technique of printing and engraving are the principal qualifications required by the forger. Two hundred years ago a proficiency could be acquired in these things almost equal to that of to-day. It might not be gained so easily but the forger, then as now, was prepared to take trouble.

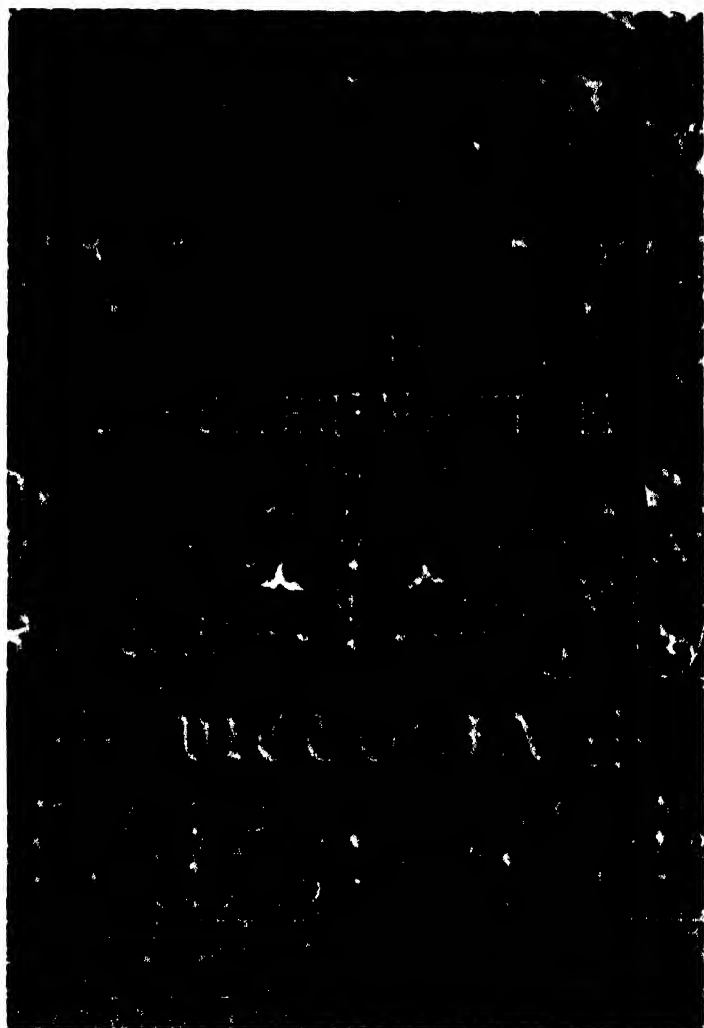
For this reason the early forgery cases were much more serious, if not so common as they are now. It is not even entirely true that they were less common.

There are periods when forgery in the past has swelled to serious dimensions. On the whole, however, large-scale forgery was more common, petty forgery not so much indulged in as it is to-day. It must be remembered that many, perhaps the majority of cases, of document forgery never come before a court of law so that statistics are not easy to compile.

What is true of forgery is also true of coining. Here skill with the hands is necessary and some knowledge of metallurgy. The simpler practical applications of metallurgy do not differ greatly from the methods used in the past, so that the coiner as much as the forger was almost as well equipped in the eighteenth century as he is now. In modern times it is true of both that the means of detection have improved, and for this reason alone the early problem differs from the contemporary one.

Forgery and counterfeiting are in this respect not altogether comparable with other types of crime. There has been increased efficiency in the machinery of detection but there has also been increased criminal efficiency. Improvements in the technique of forgery have not been so much in the methods of manufacturing counterfeit notes or coin as in the organization of distributing them. This has very greatly improved of recent years, but in strictness forgery and uttering are entirely separate crimes. It is the technique of uttering not that of forgery which has improved.

This contention is borne out by a consideration of early forgery cases. Charles Price, who has already received a brief notice, is an example. From a technical point of view his forgeries were quite first rate. It is



By permission of Mrs. and Miss Stevenson, "The Green Man," Putney.

REMARKABLY SKILFUL WORK OF A FORGER.

(Section of a slate enlarged 2 diameters. Engraved with knife in a badly-lighted cell in Portland Prison, 1882, by J. Wilson, who was serving a sentence for forgery. On account of his skill, he was afterwards appointed an examiner of notes by the Bank of England.)

doubtful if any modern forger has improved upon them, and few have done so well. In general, the criminal who plays a lone hand stands a better chance of escape than one with confederates. This is not the case with forgery, a fact which Price discovered to his cost. He took extraordinary precautions, had three different places of residence, and numerous disguises. None of his agents was aware of his identity, but he used at the same time to pass his own counterfeit notes.

Price was not suspected and traced through the forged notes. They were so excellent that a considerable period elapsed before they became suspect. But one of the notes he had endorsed was found to be forged and the pawnbroker remembered the name of the man from whom he had received it. It was Powel. This Powel unwisely returned to the shop and was arrested. He turned out to be none other than Price.

Price had never been suspected of forgery and probably would not have been detained had he not been known to the authorities as a swindler in other directions. But for this error in passing his own money he might have continued his depredations for many more years than in fact he did.

The notorious "Jim the Penman" is another example. He had forged cheques of all kinds for many years, but he was not arrested by reason of the actual forgeries being traced to him, but on account of the stupidity of one of his accomplices. This man, Hardwick by name, had gone to Yarmouth in the name of Ralph. Two hundred and fifty pounds had been

paid into the bank there in the name of Witney who was, of course, Ralph. He had, however, forgotten to instruct the bank to pay this sum to Ralph's account. On inquiry he discovered that this money could only be paid to Witney. The bank, regarding the matter as suspicious, communicated with London, and the London office in turn communicated with the police. Hardwick was accordingly detained and a letter to Saward ("Jim the Penman") found upon him. Saward was in this way also arrested. Even then, it is doubtful if any serious charge could have been formulated against him had not his accomplices, Hardwick and another called Atwell, turned queen's evidence at the trial. In this case also the organization and not the forgery was at fault.

On the other hand, Griffiths, the coiner of Birmingham, counterfeited for twenty years before he was arrested. And when he was taken it was through no fault of his, but by reason of an accidental association with Burnet. This forger is notorious in English criminal history as the only man who has ever succeeded in stealing any of the paper from which five- and ten-pound Bank of England notes are made. Griffiths manufactured, but apparently never uttered coin.

These instances, far from being exceptional, were the rule. They supply disquieting hints as to the amount of false money which must have been in circulation in Great Britain at certain periods in the eighteenth and nineteenth centuries. Ultimately it was, of course, always recognized and withdrawn from circulation, but the time lag must have been in

many cases considerable. Besides the extent of the depredations, the astonishingly lengthy periods that the authors enjoyed their freedom and so were enabled to continue their activities were an embarrassment to the authorities and a menace to the public.

In the matter of documental forgery no satisfactory method existed of proving falsification or of bringing it home to the author. It will never be known if the trial and conviction of the Perreaus for forgery was not a grave miscarriage of justice. In the March of 1775 Robert Perreau presented a draft for £7,000 drawn, he alleged, by his brother Daniel, to the banker, Mr. Drummond. The endorsement purported to be the signature of Mr. Adair. The draft was offered as security against a substantial loan.

The banker on examining the signature expressed doubts as to its authenticity, and he refused to accept the document without further inquiries. He asked Robert Perreau if he had seen Adair countersign it. Perreau replied in the negative, and stated that it had never occurred to him to doubt the signature. The draft had been given to him by his sister-in-law, Mrs. Rudd.

The signature was inspected by Mr. Stevens, Secretary of the Admiralty, who at once pronounced it a forgery. The good faith of Robert Perreau does not seem to have been questioned at this time. He at once agreed to submit the document to Mr. Adair himself.

This was done. Mr. Adair's answer was a flat denial of the signature. Upon his representation the Perreaus and Mrs. Rudd were detained and appeared before Sir John Fielding charged with forgery.

Mrs. Rudd was admitted to king's evidence. She had admitted her complicity to the extent of allowing that she had offered her help in obtaining Adair's signature, and that she had done this at the Perreaus' instigation. The two Perreaus were committed for trial. Before the proceedings a report was circulated that Mrs. Rudd's relations with Adair were such as to suggest that she might have had some claim upon him. This interesting report was not made use of by the defence at the trial. It was certainly double edged and might have been turned against the accused. If, however, there was any truth in it, this circumstance might have been absolutely vital for a reason that will presently appear.

The foundation of the prosecution's case at the trial was that the Perreaus had instigated the forgeries which had actually been carried out by Mrs. Rudd. The defence was a denial of all knowledge that the signatures were forged, and the plea that the accused had been deceived by Mrs. Rudd. There is no doubt at all that there was considerable scepticism as to the truth of Caroline Rudd's evidence. She was supposed to have been implicated against her will which was the reason of her admission as a witness for the Crown. Her evidence at any rate resulted in the conviction of the two brothers.

Before their execution, Caroline Rudd herself was put on trial for forgery. She pleaded that having been admitted to king's evidence she ought not to be tried as a principal. This was disallowed on the grounds that if she had told the whole truth she had nothing to fear from the trial, if not she had no claim,

in equity, to exemption from an examination designed to ascertain the truth. It was ruled that the trial should proceed. I know not by what precedent or principle their lordships made this ruling. The proper course would seem to have been to try Caroline Rudd for perjury. In the matter of the forgery she had appeared as a Crown witness. She was then prosecuted by the Crown on the very charge to which she had a little before given evidence on its behalf.

After the trial in which it is probable that—as in the first—both witnesses for the prosecution and defence committed perjury, Caroline Rudd was grudgingly acquitted by the jury.

In this affair it is perfectly clear that the only chance of arriving at the truth would have come through a scientific examination of the signatures themselves. This was impossible at that time.

The possibility that there had been no forgery at all is not an aspect of this extraordinary case which has received much attention. On the face of it the solution seems improbable, but on the evidence there is certainly nothing to disprove it. It is not improbable that some of the alleged forgeries were genuine. Caroline Rudd seems at some time or other to have been on intimate terms with Mr. Adair. It was suggested that she could have obtained money from him without much difficulty. But she had not to ask for that. Only his signature to a draft was required.

It appeared in evidence at the trial that the Perreaus had repaid a large amount of money borrowed on these drafts which were alleged to have the counterfeit signatures attached ; and this, before they had

any reason to believe that a prosecution was pending. This was surely a point in their favour. It was probably quite true that they had made use of Caroline Rudd to secure Adair's signature. She may have succeeded in obtaining it once or even twice by fair means, and, having afterwards been refused, resorted to foul.

This is at least a likely solution as that of the unmitigated guilt of Robert and Daniel Perreau, and the innocence of Caroline Rudd which makes it necessary to assume that she was a helpless and unwilling tool in their hands. It would explain many inconsistencies and contradictions in Mrs. Rudd's evidence.

On this theory also, Adair's part in the prosecution is quite clear. He prosecuted on the signature of one draft which he knew was false. The evidence in regard to the others was left to look after itself. Even the alternative that all the signatures were genuine is not inconceivable. Adair who, it might be assumed, was being blackmailed by Caroline Rudd, might have chosen this way of ridding himself of the danger. She, fearing that her declaration would not be believed, might well have preferred the alternative of turning king's evidence, committing perjury, and sacrificing the Perreaus.

Whether any of these solutions is correct or not is hardly so important as the fact that no satisfactory explanation of this mysterious affair was forthcoming at the time, or has been formulated since. But a modern scientific examination of the documents would almost certainly have established their authenticity or the reverse, and if they were, in fact, counterfeit, who had

forged them. Scientific evidence is essential in a case of this kind. In the peculiar circumstances Caroline Rudd's evidence, even though it admitted or asserted unwilling complicity, was absolutely worthless. That was agreed upon at the time. It was not only the verdict of public opinion, but one implied by the Crown in its ruling that there should be a second trial.

The chief evidence in the Perreau trial regarding the forgeries themselves was given by Adair's valet who asserted positively that they were not genuine. Where even a moderately competent forgery is concerned, opinions of this kind are a very unsafe guide in spite of the fact that the witness may know the handwriting or signature well. The evidence of the valet was as worthless as that of Mrs. Rudd's except that there is no reason to believe that it was not bona fide.

Early instances of forgery occur in which the manipulation has been established by internal evidence. The signature counterfeited by Dr. Dodd, as we have already seen, was detected by reason of some suspicious-looking blots. In general, however, suspicion or detection has not arisen from an examination of the signature or writing itself but because of some related circumstance.

The curious but almost forgotten affair of the Yates Bible is principally remarkable for the combination of exceptionable astuteness and shortsighted stupidity which marked the attempted fraud. The intention was to recover by means of forged documents the sum of some £200,000, the estate of a certain Lieutenant-

General Blake which lay in Chancery and had passed to the Crown in default of an heir. This had occurred in 1883 as the result of a formal suit between the Solicitor- and Attorney-General.

There were at least ten claimants after this date who made claims in respect of the estate, but all of them were dropped mostly on account of want of funds.

About 1896 a solicitor named Joseph Yates put forward a claim on behalf of a family of Irish origin resident in Liverpool, named Sheridan. The Sheridans apparently had some claim, since Mrs. Blake, the last established holder of the estate, had been a Sheridan.

The solicitor produced documentary evidence in the form of a bible and a diary of Martin Sheridan. The fly-leaf of the bible contained a record of events relating to the Sheridan family covering the later part of the eighteenth century down to 1860, and the diary also contained entries relevant to the claim. Yates also produced a silver watch engraved with the words "From Helen Blake to her dear nephew Patrick Sheridan" and dated 1866. It was this piece of evidence which provided the first clue that something was wrong. The engraver, thinking that the date 1866 was an error, altered it to 1896. Yates returned the watch, directing him to engrave the date 1866 as he had been instructed to do. The engraver informed the police.

All the evidence had, of course, been manufactured with intent to defraud. In the matter of the forgery itself Yates had taken great trouble. He had fully acquainted himself with the history of the family,

and the general data were ingeniously and plausibly set out. The dates also were quite consistent with accuracy. The solicitor had used special ink which he is said to have manufactured according to a recipe belonging to a period contemporaneous with the entries made. He had bought several old bibles and experimented with them with the view of producing a satisfactorily fictitious appearance of age. Having taken these elaborate precautions it seems the more curious that he should have made the mistake of using a Protestant bible. The Sheridan family were Irish and Roman Catholic. The bible in question was supposed to have come from Ireland, an almost impossible circumstance for the eighteenth or early nineteenth century.

The most curious part of the case was that the Sheridans seem undoubtedly to have had a claim to the estate. Before committing the forgeries and manufacturing other proofs, Yates had been to Ireland and interviewed a number of persons who were prepared to declare on oath that the Sheridans of Liverpool were the next of kin to Mrs. Blake. But he had been advised that there were some defects in the claim, which the fraud was designed to remedy.

The bibles were traced to Yates' office, and bottles of ink were found there. The detectives also discovered two silver watches which Yates had had engraved and some coffin plates which he had buried and dug up.

Joseph Yates was accordingly arrested. He was never tried on this charge, but for forging a will, and conspiracy in other directions to obtain money by

false pretences. His record was bad and he was sentenced to penal servitude for life.

In this much later case the forgery was discovered by internal evidence, but it was not on account of any examination of the handwriting itself but rather by reason of a foolish miscalculation of the criminal himself. It is very interesting to consider what would have happened had Yates been tried for forgery and had pleaded that as far as the documents were concerned he had uttered them in good faith. Bibles were found in his office. Not conclusive. He was interested in bibles, and thus had made the discovery which had turned out so unfortunately for him. Two bottles of ink were also found concerning which he could give no satisfactory explanation. It is not possible to convict a man of forgery and conspiring to defraud merely on the evidence of two bottles of ink. Even if it had not succeeded Yates would have had the material for a very strong defence. He could not have been conclusively proved guilty except it could have been proved that he actually made the entries in the bible, that the ink upon its flyleaf was of the same type as that found in his office.

As early as the middle of the nineteenth century the so-called handwriting expert had appeared. There has been associated with graphology perhaps more quackery than with any other branch of applied science. It was frequently perfectly sincere, but it was quackery none the less. The experts were not able to explain the principles which guided them in arriving at their conclusions. This was for the very good reason that there were none. Handwriting had

not been studied scientifically, and the expert's methods relied upon guesswork, more or less inspired. It was not at all uncommon for two such experts to appear on different sides, both asserting in unequivocal terms that their conclusions were correct, without producing any series of inferences from observed facts upon which an impartial referee could have arrived at a decision. When the experts agreed it was very often subsequently proved that they were in error.

In 1866 a claim was made by a certain Olivia Serres to royal descent. This lady called herself the Princess Olive and declared herself to be the grand-daughter of the Duke of Cumberland. It was alleged that prior to the Royal Marriage Act the Duke of Cumberland had been married clandestinely to Olive Wilmot in 1767. The daughter of this alleged marriage married a Mr. Serres. Olivia Serres was the daughter of this marriage. The papers in connexion with this case were submitted to experts in handwriting who quite definitely pronounced them to be genuine.

This decision was given in the teeth of the rebutting evidence which was overwhelming. It is beyond reasonable doubt that the petitioner had no grounds whatever for her claim. She was not prosecuted for conspiracy, but the Court may have supposed that documents which had deceived the experts in handwriting might perhaps have deceived the petitioner herself.

Very serious miscarriages of justice may arise as the result of evidence in the matter of handwriting. In 1879, Sir Francis Truscot, a former Lord Mayor of London, was tried for a criminal libel alleged to

have been contained on a postcard sent to an acquaintance. The two most eminent experts of the day agreed that the writing was unquestionably that of the accused. Fortunately for Sir Francis this evidence was absolutely rebutted by a witness named Smith, who admitted that he himself had written the postcard.

These experts, Netherliff and Chabot, as a matter of fact could not justly be described as quacks in the sense that this opprobrious term is generally understood. They were the forerunners of the scientific method. But their system was founded upon the old mistaken view that comparison was a sure guide in such matters. They were scientific in the sense that to make this comparison they used scientific instruments, the lens and the microscope, and that they were conscientious and took great trouble minutely to observe the matter submitted to them. They really inclined to the view, which is fundamentally wrong, that an individual's handwriting had a quality akin to that of his fingerprints ; that if a sufficient number of points of resemblance could be established between two specimens of handwriting one of which was known to be genuine, then the genuineness of the other was established. Conversely, if the points of resemblance were not there, then, however great the general resemblance, the disputed writing was forged. The theory was not quite so elementary as this, but that was the principle upon which it rested.

Nous avons changé tout cela. These points of resemblance are an extremely dangerous foundation upon which to build a graphological theory.

From the other point of view, there was a line of investigation which was never followed up in the earlier days. There are methods of examination which, when applicable, can establish proof of forgery beyond reasonable doubt. A chemical examination of the ink in the Yates Bible is a case in point. It could now be proved if the ink on the flyleaf of the Yates Bible corresponded with the ink found in his office.

Similarly with the petition of Olivia Serres, it is safe to say that a chemical practitioner in the twentieth century would probably have made very short work of the signatures and writing generally on the documents put in as evidence on behalf of the petitioner. Most of the material documents must have belonged to the year 1767. The ink used at that time differed profoundly from that commonly employed a hundred years later. A chemical examination would not have shown the exact date when the documents were written, but it could have proved—however superficially clever the fake—if they belonged to the eighteenth or the middle of the nineteenth century. This could only have been defeated if an exceptionally clever and resourceful forger had been at work. In such a case he might have prepared ink according to an eighteenth-century formula. Even that would hardly avail now. The scrutiny of the microscope and the ultra-violet ray is too searching to permit the success of even such subtle devices as that.

These are the methods, hardly known and certainly unpractised by the early experts, which have been so highly developed of recent years. The tendency has been whenever possible to concentrate not upon what

the forger has written so much as upon the materials he has used. Any abnormality here may provide proof quite as irrefutable as that of the presence of a fatal dose of arsenic in the body of a victim who it is suspected has been poisoned.

This review will have done its work if it leaves on the reader's mind a sense of profound dissatisfaction. The cases quoted are all quite typical, the rule and not the exception. Proceeding from the eighteenth century to quite recent times there is no single case, as far as document forgery is concerned, in which we are entitled to feel satisfied beyond a shadow of doubt that justice has been done and the truth discovered. We shall see in the next chapter if the modern developments have done anything to increase our confidence in technical forensic methods as they relate to forgery.

CHAPTER X

MODERN PROBLEMS

IN the January of 1931 a man named Frank Greissmayer was sentenced to a term of imprisonment for forgery. He pleaded not guilty on the grounds that having no hands he could not possibly have committed the crime. Evidence was, however, given that Greissmayer had previously been convicted for a similar offence.

Before his committal to gaol the prisoner favoured the court with an exhibition of his method of writing by holding the pen between his teeth.

This authentic case is probably unique. It demonstrates very well the remarkable power of adaptation possessed by human beings. This power of adaptation is the quality which makes forgery possible. It explains the noteworthy fact that victims of forgery themselves have sometimes picked out the forged specimen of their own signature from two submitted to them, and declared emphatically that the genuine example was a forgery.

As we have already seen, there is no sufficient reason for believing that manipulative skill in the imitative sense is any greater than it was a hundred or two hundred years ago. On the other hand, the methods of manufacturing documents are more varied and refined than they were. There is, I think, no

early example of an attempt to remove ink from a document by chemical bleaching. We look in vain for the example of the traced forgery, a method in which, as we shall see, there has been a good deal of specialization in America. Besides this, although manipulative skill among the heads of the profession stood very high, the clumsy type of forgery of notes and money was more prevalent than it is now. In civilized countries the clumsy forgery is not now common. The service of detection is so highly improved that it is not even temporarily profitable.

But the following anecdote, if it is true, suggests that those through whose hands large sums of money pass are not always as circumspect as they should be.

During the War when paper money was reintroduced after a long period of disuse counterfeiters of notes became active. The co-operation of the public is an essential part of the rapid suppression of this kind of fraud, and a careful inspection of the paper with an immediate report of anything suspicious is of the greatest assistance to the authorities. In order to ascertain if any care was taken in this regard a false ten-shilling note was put into circulation the general appearance of which was not too suspicious. Even this, however, was designed not to resist too close a scrutiny. The details were entirely incorrect. For the motto surrounding the King's head letters were chosen at random. The Treasury signature was replaced with the words "I don't think." Neither the engraving nor the type faces of the lettering was perfect.

This note remained in circulation for a considerable time. It is said to have passed several banks and one or two insurance companies.

However this may be, it remains true that the most serious aspect of modern forgery is that when carried out at all it is generally on a large scale. The damage done is directly as the length of time the forged money is in circulation, and if large sums are involved the situation may become serious. Many millions were involved in the forgeries of German notes in 1927 and 1928. So serious was the situation that many of the large banks installed ultra violet ray apparatus to examine the paper of every twenty-mark note presented. The forgeries were excellent and could not be detected by the non-expert. The paper used, however, was not the official quality, and this provided the only rapid means of distinguishing the true from the false.

But document forgery remains as the most intricate problem. Forged notes and counterfeit money are, in the end, always discovered. A forged document may pass for many years as genuine. Many have, while some concerning which there has been strong suspicion and much legal argument have never been proved to be counterfeit at all. With forgery, as with other crimes, legal proof and moral conviction do not always coincide. A. S. Osborn, the famous American graphologist, has made the disquieting assertion that there are periods in the history of forgery in the United States when it might be claimed that not more than 50 per cent. of the documental forgeries were proved to be such in spite of the conviction of the

experts. There are further those uneasy minds who may speculate regarding the perfect forgery. Such does not exist, but even if it did, the speculation is useless since detection would obviously be impossible.

On September 24th, 1900, Arthur Carey, the late Deputy Chief of the Homicide Bureau, New York, tells us in his autobiography *On the Track of Murder* that he was instructed to go to an apartment in Madison Avenue, New York, to view the body of a William T. Rice ¹ who had died there, and to inquire into the circumstances of his death. He found in the apartment an attorney, Albert T. Patrick, and the valet of the dead man named Jones. Patrick was quite calm, Jones seemed extremely nervous.

Patrick explained that he had made arrangements to have the body cremated. This the coroner's physician would not allow. Patrick insisted that the death was natural, that he had written instructions from Rice, whose attorney he had been, that his body was to be cremated. The undertaker declared that the crematorium was then being got ready.

This haste and insistence upon natural death was regarded as suspicious. An examination of certain cheques which came into the hands of the police did nothing to allay it.

On the very morning of Rice's death a cheque for \$25,000 had been presented for payment at his bank. The payee was Patrick; the cheque was, of course, signed by Rice. The payment would immediately have been made had it not been for a mistake on the

¹ There is slight inaccuracy here. Rice's initials were actually William M.

cheque. It was made out to Patrick but his Christian name Albert appeared without the "l." The endorsement on the back included it. The clerk in consequence refused payment until the correction in the name had been made and initialled. The bearer of the cheque returned almost at once with the necessary alteration, but the clerk not feeling entirely satisfied telephoned Rice's apartment and inquired if the cheque was in order. Jones replied and vouched for its genuineness. The cheque was accordingly stamped and the money about to be paid when one of the partners heard of the transaction. He insisted upon communication with Rice himself. Upon further getting in touch with the apartment the bank was informed that Rice had just died. In spite of protests by the bearer the bank refused to honour the cheque. Patrick himself had later presented himself, and had also been refused. After consultation the bank and their solicitor communicated with the police.

It then came to light that three further cheques for large sums had been presented and honoured at another bank where Rice had an account.

Arthur Carey informs us that when the documents reached police headquarters he placed one over the other and held them up to the light. As a result of what he saw, the documents were immediately submitted to David Carvalho, a handwriting expert.

The examination of the cheques proved them to be traced forgeries. This was established by the fact that all the signatures were exactly alike. Patrick and Jones were both arrested. As a result the most intricate and extraordinary conspiracy in which these

forgeries figured was revealed. Jones, the valet, confessed and fully revealed the plot.

The case is remarkable in a number of ways, but more especially on account of the number of signatures forged and the brilliantly elaborate precautions taken by Patrick.

Patrick insinuated himself into the confidence of the valet Jones, a man whom his master had befriended. He had told a story which was quite true that he was engaged by the other side in pending litigation as to the residence of Mr. Rice in Texas. It was claimed that it was not bona fide. A large sum of money was involved relating to the estate of the late Mrs. Rice. He hoped to obtain evidence from the valet favourable to him.

The valet was Rice's confidential servant, and Patrick had assiduously cultivated him. He learnt about Rice's will which he afterwards persuaded Jones to let him inspect.

The first forgery arose out of the matter of the litigation. A letter was typewritten by Jones in which Rice appeared to have no hope of winning the lawsuit. A forged signature was appended to this letter.

A will was drawn up by Patrick which he altered from time to time. The final draft left him the sole executor, and entirely excluded the charities of which Rice was a patron.

The difficulty now arose that Patrick was perfectly well known to Rice who strongly disliked him on account of the legal dispute in the matter of residence in the State of Texas. The attorney feared it might

excite remark if he appeared as residuary legatee when his relations with Rice were known. He endeavoured to win the old man round by suggesting a friendly settlement of the action, but he failed.

A series of letters were accordingly forged purporting to show that Rice had done a great deal of business with Patrick and had great confidence in him. There were also directions as to how the terms of the forged will were to be dealt with. Carbon copies of all these documents were placed in the Rice files by Jones.

The subtlest and cleverest move was the one to establish the authenticity of the traced forgeries. Patrick through Jones obtained possession of three cheques signed by Rice before they were dispatched, together with three blank cheques. The three blank cheques were filled in and the signatures traced from the three genuine cheques. These forged cheques were dispatched in the place of the genuine ones. They were of course honoured. The object was to appeal to these cheques and the signatures upon them if the question of forgery of the other documents were raised.

Further cheques were then forged to defray expenses expected to be incurred in the litigation arising out of the forged will under which the whole of the Rice estate, worth some \$3,000,000, would be under Patrick's control.

Patrick now began to plot the old man's murder. He was over eighty, but on the whole healthy. The attorney was anxious to lay his hands upon the money as soon as possible.

Again through Jones, he succeeded in getting Dr.

Curry, his own physician, to attend Rice so that he might be kept posted as to the state of the millionaire's health. The old man had indigestion and mercury pills were prescribed. Patrick then instructed Jones to give his master pills of great strength. These made the old man ill.

That which precipitated the murder was a call made upon Rice to meet the costs involved in the destruction of an oil plant in Texas in which he was interested. He notified the company that he would support it to the extent of \$250,000. Patrick knew that there was not sufficient money in the bank on which this cheque would be drawn to meet it, for the very good reason that he had been drawing money himself. A day or two before a draft on Rice for this amount was to be delivered in New York, Patrick decided to act. He prevailed upon Jones who was completely under his influence to poison the old man with chloroform. The chloroform was bought and Jones instructed how to use it. The valet at first demurred, but ultimately gave in. He chloroformed his master while he was asleep. Jones must have followed his directions carefully for there seems to have been no struggle.¹

Patrick was apparently under the impression that chloroform would leave no traces. He was anxious that the body should be cremated to prevent an

¹ It is very difficult to chloroform a person, and the "chloroformed handkerchief" story is a myth. The mere application of a handkerchief soaked in the anæsthetic to the mouth and nose of a sleeping person is probably the best method of waking them up.

autopsy and the consequent detection of the mercury. The delay which would necessarily occur before the cremation could be carried out did not enter into his calculations. Patrick might otherwise never have been tried and convicted. Traces of chloroform were discovered at the autopsy.

Patrick, who had originally been arrested and held on a charge of forgery only, was tried and convicted of murder. Jones was admitted to State evidence and in consequence escaped. Although the charge was one of murder, the testimony in regard to the forgery figured in it very largely. To prove the forgery was to prove the motive.

This was one of the first occasions in which Osborn's method for the detection of forgery was employed. The suspected writing is photographed under glass metrically ruled in squares. This demonstrates accurately and in a very striking way the size of the individual letters and their distance apart. It was shown by this method that the signatures were traced, and besides this the models from which these tracings were taken were discovered, and the exact correspondence between them and the forgeries was shown. Composite photographs were also prepared which showed the correspondence of the lines at all the material points.

The revelation of these ruled squares is particularly damning, because it is so evident to the layman. Of the four specimens of the signature on the will each letter occupied the same position in the same small square. The forgeries were not particularly good, and it is surprising that so astute a man should not have

taken more trouble. Patrick had paid no attention to what the graphologist calls shading. The signatures all look extremely spidery. It must be borne in mind, however, that not a few cheques forged no more artistically had actually been accepted by the banks, and even those presented on the day following the murder were refused at first only on account of the spelling of the name of the payee. Patrick having succeeded so easily no doubt thought that the remaining signatures would be accepted.

And they might have been but for the omission of the letter "l" in his Christian name. Had this not aroused suspicion, that of murder might never have crossed anyone's mind. And while it would have been more difficult, and also while the Court of Probate's scrutiny of the signatures on that will would have been more severe, it is to be hoped, than that of the bank, who can declare with certainty that Patrick would have lost his case ?

It is probable that he would have done, however, for at the first breath of suspicion Osborn's ruled squares would have been produced in evidence against him. Thanks to the technique introduced by this graphologist, the traced signature has no chance of acceptance if once it becomes suspect.

This method belongs definitely to the modern technique of forgery, which it was designed to combat. Referring back to the early methods of Netherclift and Chabot we are at once confronted with a very surprising conclusion. The principles of these early graphologists rested more or less upon the theory that if a sufficient number of points of resemblance

Je t'embrasse à mi nu
 ce que je possède tou
 - Charlet Michel otie
 Charlet doi Charlet affe
 - Charlet Michel _____
 - Charlet Jean _____
 - Jeouassou Jean _____
 - Jeouassou arreman
 - Jeouassou françois

— Harmonik le 2 jour

1917
 — R. Encourch Luc —

By permission of Dr. Ed. Locard.

RETOUCHING IN FORGERY.

(The arrows indicate characteristic mistakes made by the forger in re-touching.)

could be demonstrated the writing was genuine. They had not, of course, the traced signature in mind for in this case the precise contrary is true ; and it is interesting to speculate how these experts would have regarded a single specimen of a traced signature of which the original was not available.

The traced forgery properly executed which exists alone, and the original of which has been destroyed, is one of the most dangerous of modern examples. It is not necessary, after all, always to have to deceive the expert. The aim is rather to avoid suspicion so that the matter never reaches him. Once in the modern expert's hands the traced writing will not escape the scrutiny of the microscope. If the original is not available and the forged signature or other writing has not been duplicated the line quality has to be examined. However expert the forger, he always betrays himself. The strokes are not assured ; there are tiny blobs of ink corresponding to hesitations and retouchings. These doubts, fears, and hesitations can be read as clearly under the microscope as if they were written in a book.

A particularly elegant and brilliant demonstration of this is to be found in one carried out in Locard's laboratory at Lyons in the matter of the Renourch forgery at Chamonix in 1917. The forgery shows good shading effects, and was a competent piece of work. But the minute retouchings were clearly demonstrated at as many as seven points in one capital letter. The method of their presentation was such that the non-expert could not fail to notice them and recognize their significance when they are pointed out.

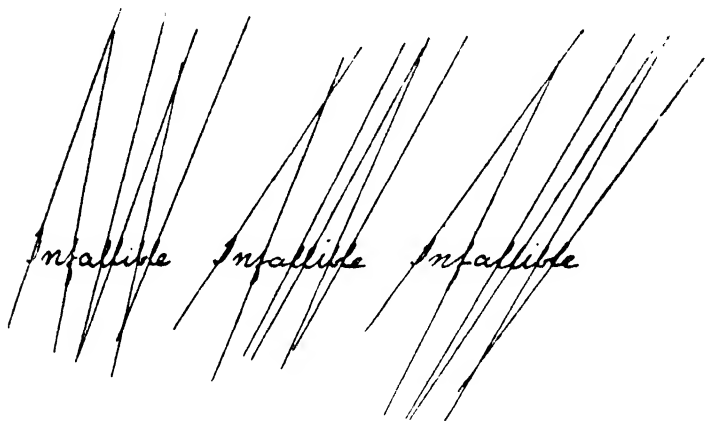
That is the forger's difficulty. He cannot rest satisfied with his work. He must go over it again and leave the marks of the machinery of fraud upon his handiwork. But it remains true that, if his is a practical hand, all the resources of the microscope, of photography, and of exact measurement will be required irrefutably to prove the falsification.

Any freehand forgery, whether guided by traced original or carried out by the imitative method, can, however, scarcely be so facile as the characteristic script. The quality of the line, perhaps natural enough to the naked eye, does not easily escape the revelation of high magnification.

The characteristic details which the modern detective of forgery looks for differ from those originally considered important. Measurement of heights and angles of slope generally have a very significant story to tell. The practised forger can alter the form of the letters in accordance with the writing he wishes to imitate, but he cannot change the relative height of the letters. The reason is that it is impossible to tell by observations what they are. In the very large majority of cases if the height of the letters of two specimens of handwriting which look very much alike are measured and the ratio between them worked out, the two sets of ratios will be entirely different. It is a remarkable fact that these ratios are constant for the same person, and even if he changes the size of his handwriting the ratio as between the heights of the letters remains the same.

Slope obeys more or less the same laws. This is an experiment that those interested can try for them-

selves. If a word is written naturally and the writing is allowed to take the normal slope, and afterwards the same word is written with the slope consciously changed it will be found that the relation between the slopes of the letters is the same in each case. To show this draw lines through the long letters thus :



These ratios are not exact, but if in a suspect piece of writing the relative angles of slope vary profoundly from that of the writing known to be genuine, something is probably wrong. Forged writing quite capable of eluding ordinary examination may differ considerably from the genuine in this respect. *Relative angles of slope* do not make much difference to the appearance of the writing except to the practised eye.

These tests are not necessarily conclusive in themselves. In a good forgery no single piece of graphological evidence is conclusive. All the abnormalities have to be added up and a decision made on the whole. But the importance of these new methods of analysis

is great because they are not arbitrary but rest on the basis of observed fact. Tentative, they cannot be said to be applicable in absolutely every case, but there is scientific method in them.

They cover a great deal more ground than the older methods. These were merely concerned with the careful examination of minutiae. It is quite true that if two specimens of writing disagree in a number of minute points, the shape of the "i" dots, the tiny hook directed left or right sometimes to be found at the extremity of a stroke, and the position of the hiatus, to quote three examples, there must be strong suspicion of forgery. But the converse is not necessarily true. Similarity in such minutiae is not certain evidence that the writing is genuine.

Unsound conclusions of this kind were probably responsible for the groundless suspicion that Sir Francis Truscot suffered. At this inquiry the experts swore that the writing on the postcard *agreed* with that of Sir Francis. Subsequently it was proved conclusively not to be his. There was no question of forgery here but a similarity of handwriting. No doubt can exist at all that the experts did not rely upon mere superficialities. They were too conscientious for that. There must have been substantial agreement in the minutiae of the two specimens.

The modern methods of handwriting analysis described here and others similar in principle but more elaborate, if they had not established the dissimilarity of the handwritings beyond all possible doubt, would have thrown the assertion that they were written by the same hand open to the gravest doubt. The evi-

dence of a modern graphologist would have acquitted Sir Francis Truscot. That of the experts of his day very nearly convicted him.

But it must not be supposed that modern methods of height and angle measurement have reached their final form. Emphatically they have not. At the moment it is their real importance that once they are determined the principle of how to interpret them is applied scientifically.

A hint as to the difficulties may be of interest. It is comparatively straightforward, although extremely trying work, to measure the heights and breadths of handwriting. The graphologist enlarges the handwriting four or five times, and proceeds to measure it with a delicate scale graduated in fractions of a millimetre. The determination of the angle of slope is, however, very much more difficult. With the long letters, if the foundation stroke approximates to a straight line, the matter is fairly simple. A straight line is simply drawn through in one and the same straight line with the stroke. But how are we to determine the angle of slope of the letter "o"? The written letter "o" is an ellipse. The only way of determining any slope it may have is to discover the two foci of the ellipse and draw a line through them. This, quite simple in theory, is very difficult in practice. Again, it is not easy to draw straight lines in one and the same straight line with the strokes of small letters. Approximations are no use. If the angle of slope is not exactly determined the results may be dangerously misleading.

It would be quite out of place to discuss problems

here which would require a separate volume. They are mentioned so as to show that we are only at the beginning of the scientific examination of handwriting. But these beginnings are being built upon sound foundations.

The examination of minutiae in the traditional manner is also carried out. That in the past wrong conclusions have been drawn from the results of this kind of investigation is not to say that no useful conclusions can be drawn from them at all. There are some forty different ways of dotting an "i" clearly distinguishable when the dots are magnified. There is the position of the "i" dot. The loops of the letters, pen lifts in the formation of letters are also important, and the degree of retrace between a connecting stroke and the staff of the letter. These things are not conclusive, but they must be noticed. The examiner knows that in a forgery of any length fatigue is an important factor. There is the tendency to return to the writing characteristic of the forger. At first he pays attention to these details as far as he can, but as time goes on slips increase in number and in obviousness. It is much easier to detect forgery where a hundred words can be examined than where only one or two are in dispute.

These imitative methods are only one aspect of the problem of forgery. In a sense they are the most difficult to prove. Clearly, in all cases of imitation it is a strong perhaps overwhelming presumption which is established, but it remains a presumption. In the second place, the methods of examination, in principle fairly simple, are in practical application elaborate

and consequently not easy for the layman to appreciate. After all, the findings of the expert have to be adjudicated upon by a judge and jury, and while the trained legal mind can nearly always follow expert evidence, the jury may find themselves in very deep water. A verdict founded upon evidence only half understood or not understood at all does not invite confidence ; least of all when it is swayed, as that French jury was swayed, not by an appreciation of the expert evidence, but because they did not wish to be thought greater fools than their countrymen who lived in the big towns !

If then the expert testifying as to forgery, or for that matter as to any other kind of crime, can present his evidence in such a way that it cannot fail to be grasped by those in whose hands the verdict lies, so much the better.

There are scientific men who claim that expert evidence ought to be accepted without question. There is not a very good case for this, for, although this is not the motive behind the contention, the expert in this position is substituted for the judge and jury. Whatever we may think of this in theory, it is repugnant to the principles of law of all European countries and of America. There is no opinion more ill informed than that which supposes that on the Continent the expert abrogates to himself judicial functions. His position is exactly the same as it is in England.

It is desirable to produce evidence in a form that the Court can understand, and in the matter of certain kinds of forgery this technique has been very highly

developed of recent years. The nature of the proof supplied in this direction is a great deal more conclusive.

The matter which the forger attempts to copy, and the materials he uses for the purpose, are quite distinct; but scientific examination of the latter may often be more conclusive than a graphological examination.

Let us consider an instance. What could be more tempting to the forger than a cheque carelessly made out for eight pounds? Too much room has been left between the word "eight" and the word "pound." As to the figures, there is also here some available space. It is only necessary to add a "y" to the "eight," to place a cipher after the figure "eight" and the cheque becomes one for eighty pounds.

Here is a case where the ordinary graphological methods may not avail. To forge a single letter, a single figure, and that a cipher, presents fewer difficulties than the imitation of a signature, and by graphological analysis alone it could not be detected. We have to fall back upon an examination of the writing material itself. If it can be established that the ink is of different composition or more recent than that on the rest of the document, there is at once absolute proof of something being wrong.

If words or figures have been erased from a document, it is obviously a very suspicious circumstance. If other words or figures have been substituted, and if those erased can be restored, evidence of forgery has been demonstrated.

Information as to the age of ink is often quite conclusive evidence of forgery, as in the case of a document

bearing a certain date of which it is proved by scientific examination that the ink is more recent.

If an examination of the ink on a document purporting to be ancient is proved to be of a modern type, and if the paper is proved to be modern, there is no difficulty in making out a case for forgery. Paper has often been faked to give the appearance of age. Coffee has been used for this purpose, tea, and a weak solution of potassium permanganate.

It is in these directions that the modern technique of forgery detection has developed. In such examples there is no question of expert opinion, but of scientific fact. Actual demonstration is possible in a large number of instances, and demonstration of a kind that any jury is able to understand.

To refer back for a moment to the Rice-Patrick case, this falls definitely into the modern category. It was one of the first in which ocular demonstration in the shape of enlarged photographs was actually available in Court. The photographs of the traced signatures, covered with the ruled test square, were actually examined during the trial together with the genuine signatures from which tracings had been made.

Where a single letter has been added to a word, and perhaps a cipher after some other figure, an ocular demonstration of the difference in the ink can often be made by means of photography. Ink which may appear to be of one colour when viewed by the naked eye will unequally affect a photographic plate, particularly an orthochromatic plate which is highly sensitive to colour. The present writer has in two cases taken photographs of documents upon which inter-

polations have been made in different ink not certainly identifiable as of different colour by the naked eye. The photographs taken with screens clearly revealed that which the eye could only vaguely suspect. The interpolated characters were hardly legible, the original text stood out quite clearly. No scientific qualifications are required to interpret evidence of that kind, although scientific qualifications are necessary to prepare it.

In nine cases out of ten the forger will not know with what type of ink his victim wrote the document it is desired to alter. Unless chance aids him his will be of a different type. If it is, no matter how skilful the manipulation, the forgery can be proved.

Erasures are amenable to the same methods of detection. It is hardly an exaggeration to declare that short of destroying the paper altogether it is practically impossible to remove evidence of writing which has been on it. It is not always possible to restore the text, but it is almost always possible to show that some text existed.

Where a document has been washed (i.e. the original writing bleached out) the words can always be re-developed. The chemist uses ammonium sulphide or potassium ferrocyanide. These act upon the iron residue of the ink which no bleaching will remove, colour it—black in the case of the sulphide, blue with ferrocyanide—and thus restore the original characters. Photographs of documents with restored text are particularly striking. The forged parts are not removed, but the original wording redeveloped appears alongside it.

Even mechanical erasure does not preclude re-development. It is very difficult entirely to remove the ink in this way, and a faint image can very often be restored. There is a very ingenious method for intensifying it. A photograph is taken of this faint image, and the negative is intensified. This slightly intensified image is photographed, by contact, so that in the new plate a clearer image appears. This second photograph is in its turn intensified, transposed on to another plate, and so on. The faintest scratch can be made legible by this method.

There is a more literal sense in which documents are washed in some cases. In the East it is still common to use carbon ink, that is to say ink of the Chinese or Indian variety. If the surface on which the writing is done is suitable it is literally possible to remove the characters by washing.

The Director of the Government Laboratory of Cairo quotes a most extraordinary case. From the point of view of quantity it was certainly forgery in the grand manner. One hundred and sixty-eight documents were examined of which one hundred and sixty-three were forged. Some were altogether counterfeit, some had been fraudulently manipulated, and some intentionally damaged in an endeavour to conceal the forger's operations.

One, Lucas tells us, was a document of some seventeen hundred words. The whole of the writing except the signatures had been removed and replaced with an entirely new text. In this particular instance traces of the obliterated writing remained, and a suspicious crowding of the Arabic characters also

pointed to forgery. The signatures were not at the extreme bottom of the page, so that this crowding would have been quite unnecessary.

The manipulation of historic documents and similar types of counterfeiting do not easily escape scientific vigilance.

One of the most interesting cases strongly recalls the apparently motiveless forgeries of Chatterton. Hans Gross informs us that about 1820 Wenzel Hanka produced a document which he described as the *Koeniginhofer Handschrift*. This purported to be a manuscript of poems in the Bohemian Slav tongue. His motive seems to have been a kind of misguided patriotism which wished to endow his country with the treasures of an ancient poetic literature. The verse was extremely good, and attracted world-wide attention. Goethe himself was very impressed by it, and under its inspiration wrote one of his songs. These poems were all forgeries, but they were accepted for many years as being perfectly genuine. The discovery of the falsification was due to a chemical examination of the document. It was extremely well executed and illuminated. A great deal of blue was used in the initial letters, and a chemist discovered that this was Prussian Blue. Prussian Blue was discovered at the beginning of the eighteenth century. The date of the manuscript was the beginning of the fourteenth century. This conclusion was confirmed by a critical literary examination of the poems. Historically and in linguistic form there were found to be many anachronisms. Final confirmation was to follow after Hanka's death. An examination of his library re-

vealed the instruments of fraud, and showed incidentally the immense pains which had been taken with the forgeries.

From the foregoing review it will be clear that considerable advances have been made in the examination of documents to decide upon their authenticity from internal evidence, which, if it is forthcoming, cannot be refuted. More than this, methods of demonstration have been perfected which make the evidence easy to interpret. A recent example of this arose in the litigation regarding £100,000 worth of Canadian Pacific Railway shares which a Mr. Joe Haiat claimed had been transferred to him by a Mr. John Albert Drinan. The Public Trustee alleged that the documents relating to the transfer had been forged.

A number of documents had been put in as evidence in support of the claim, and it was the signatures appended to these which were in dispute. Mr. Gurrin and Colonel Mansfield, handwriting experts, gave evidence regarding these signatures. They agreed that the handwriting was forged. The basis of their conclusion was the disjointed appearance of the pen-strokes. Photomicrographs of the letter "d" were thrown upon a screen near the witness-box to demonstrate the unnatural appearance of the line.

Problems, however, sometimes arise which are very difficult to solve. These frequently concern the most intricate of all forgeries to trace; that type in which the writer of the document is the manipulator of it.

This is not an infrequent occurrence. The Irish Sweep Stake litigation in October of 1931 provides an instance. At issue was the point that an addition

had been made to a document alleged to be an agreement between the parties. It was stated that an addition had been made to it by the party who had originally drawn it up which materially altered its meaning. The question regarding which a decision was required was if the writing supposed to be added was in fact not contemporaneous with the rest. Photomicrographs of the disputed entry were produced in Court, the expert giving it as his opinion that the addition had been made at a later time. He was, however, unable to assert this positively.

Unless there is a considerable difference in the age of the inks used upon a document, it is not generally possible to state with any certainty if all the writing is of the same date. But it is very often possible to decide if a document was or was not written after a certain date. At the trial of Colonel Pilcher for forgery it was proved quite conclusively by a chemical examination of the ink that the document (a will) could not have been written in the year which appeared from the date upon it. Ink after four to seven years has undergone chemical changes which distinguish it from recent writing. Tests upon the ink were carried out which proved that the will, which was supposed to have been drawn up in 1898, had been only recently written.

Occasionally where the forgery has been, as in the Irish Sweepstake case, an addition made by the original writer of the document, it can be proved conclusively from a scientific examination. It is obvious that if any of the strokes of two lines of writing cross each other those of the lower line being

the later writing must pass over the prior writing of the line before. If any of the strokes of the supposed prior writing pass over something written in a lower line, it has been interpolated. A photomicrograph will often show which line is uppermost, and thus reveal the manipulation.

This examination of the sequence of strokes is applicable in other cases. Captain Quirke quotes an example in which a cheque was submitted to him made out for sixty pounds in words and figures. The drawer complained that he had originally made the cheque out for six pounds. The payee, according to him, had added "ty" to the word six and a cipher after the figure. A microscopic examination of a stroke of the "y" which crossed the figure revealed it as being *under* the "6." Captain Quirke informs us that he returned the cheque to the drawer with appropriate comments.

It is to this type of examination that all the resources of modern laboratory practice have been turned. Both physical and chemical methods are employed. The chemical methods depend upon an actual analysis of the ink upon the document. In a case where it is necessary to compare two specimens of writing upon a document minute drops of chemical reagents are applied to the ink and the way that the ink reacts, the extent of bleaching or the colour change is noted. These methods are very delicate and can clearly distinguish between any two kinds of ink. Different qualities are often very similar in composition and methods of manufacture, but however insignificantly they differ chemical tests of this kind will

differentiate them. The age of the ink can often be decided in this way. At the trial of Colonel Pilcher it was proved, as we have seen, that the ink on the will could not have belonged to the year 1898. The micro-chemical test showed by the reaction of the aniline dye that the writing was recent.

Chemical tests are also applied to paper. If the forger has erased writing from a document by mechanical means, he may try to cover up the traces by applying shellac or gum to the paper to restore the surface. Alcohol will remove such artificial substitutes. A drop of benzene applied to the paper will leave a circular spot where the paper has been untouched, but a stain with irregular edges if an erasure has been made. Iodine vapour leaves a heavy brown smudge where the damage is located.

There are many reagents which will restore writing which has been "washed." Ink generally contains iron, and substances which strongly colour iron salts are used to restore bleached writing. In the case of a document recently washed the application of a piece of filter paper soaked in a solution of potassium ferrocyanide will almost immediately reveal the fraud. The writer has an example in mind where this method brought up the invisible writing in less than two minutes. The vapour of ammonium sulphide is also used when restoring a washed text. Potassium ferrocyanide makes the restored characters blue; ammonium sulphide black.

The physical methods are much more elaborate if we exclude the evidence of the microscope. The principle is the actual analysis of minute portions of

ink detached from the document. The instrument employed is the spectroscope. The spectroscope when the rays from a vaporized body pass through it determine the nature of it by registering along the length of the spectrum lines and bands which occupy a position characteristic of the body. Inks as much as any other substances can be analysed in this way. A minute fragment of the ink is vaporized in an electric arc and the spectrum of the spark recorded. Minute quantities of different ink can be recognized from photographs of their spark spectra.

Another use of this instrument is to record the "absorption spectra" of ink. This is the most delicate method of recording differences in colour. Coloured substances absolutely indistinguishable with the naked eye and even with the microscope give different "absorption spectra." This method for determining exact colour is the most delicate known to science. The light is actually passed through the ink strokes, the exact colour of which is to be determined, and it is this light which the spectroscope analyses. A detailed description of the method is too technical to be of general interest.

It is not commonly known that a loud-speaker will reveal certain kinds of forgery. It is used in connexion with testing the conductivity of different regions of a piece of paper where there is suspicion of fraudulent manipulation at certain points. Paper is highly resistant to an electric current, but its resistance varied according to its composition (the conductivity of its loading materials) and its thinness. If the thickness is altered by erasure or its composition by washing,

at the point where this has occurred the conductivity will be different. If a delicate electrical apparatus for measuring resistance is connected with a valve and loud-speaker, the apparatus can be so adjusted that while the resistance is constant the loud-speaker emits a note of consistent pitch. Thus all the normal regions of the document will proclaim their innocence. At the points of manipulation where the resistance suddenly alters the loud-speaker will change its note or be silent.

But the most recent addition to the machinery of the scientific detection of forgery has been the use of non-luminous ultra-violet rays. The rays produce fluorescence, a glow, where ordinary light has no effect. The rays if applied to a document written in different kinds of ink will reveal the difference between them. They will cause "washed" writing to show up because the paper fluoresces and the mineral constituents of the ink left on the paper do not. The Wood Light, as it is sometimes called, will distinguish between different kinds of paper, a property of immense value for rapidly discovering forged banknotes.

This apparatus is a modification of the so-called artificial sunlight lamp. The burner is essentially a tube with a bulb at each end into which the electrical connexions are fused. The tube contains mercury. When the current is switched on the heat engendered vaporizes the mercury which glows brightly and emits a high percentage of ultra-violet rays together with much white light. The principle of the Wood Light is the use of a screen which filters out almost all the

visible light and allows the ultra-violet ray to pass. It is for this reason sometimes called the "black ray." When it falls upon substances which fluoresce they are lit up more or less brightly and glow as if phosphorescent. The colour of the fluorescence varies with different materials and even with the same material when, under different conditions, its composition has slightly altered. Minute changes will sometimes effect profound modifications of the fluorescence. It is not difficult to understand its great importance as an aid to the detection of forgery.

When the Marsh Test for arsenic was discovered it actually gave rise to considerable difficulties in criminal investigation. Owing to the extreme delicacy of the test, the chemist found arsenic where he had never found it before and in consequence there was always the risk of a suspicion of poisoning which was quite groundless. More or less, arsenic exists in a great variety of materials and this has to be taken into consideration when searching for it. It has been said that the delicacy of the Marsh Test, the implication of which the chemist did not then fully appreciate, was responsible for the conviction of Marie Lafarge. However this may be, it resulted in a controversy between Orfila and Raspail which continued for many years.

The same is to some extent true of the use of the ultra-violet light in criminal investigation. It is so delicate an agent that it may reveal differences due to circumstances other than fraudulent manipulation of a document. That is why so many additional methods of examination are in use. To rely in all

circumstances upon the revelations of the ultra-violet lamp alone would be in the highest degree incautious and unscientific.

Numerous convictions for forgery have been due to the Wood Light. In not a few cases in many countries the forgery has been demonstrated in open court by projecting writing removed by bleaching and made visible under the ultra-violet rays upon a screen for the inspection of the judge and jury. But the detection of forgery is only one of the many uses to which these remarkable rays can be put.

It can confidently be claimed that the tremendous advances made in the scientific detection of the manipulative types of forgery have made it almost impossible for one to pass unchallenged at least for any length of time. Here is a definite victory for the science of criminal investigation in the continuous war which society wages with crime. But it has to be borne in mind that while the skill of the forger in the imitative sense does not seem to increase, in the direction of manipulative forgery it has certainly improved to a very great extent. Many of the modern methods of scientific examination have been brought into being especially to combat criminal methods which either were not known, or could not be applied with sufficient skill fifty years ago. And a knowledge of these scientific methods, perfectly well known to the expert forger, are not alone of advantage to the police. There is nothing to prevent the forger testing his results by the very methods which he knows the scientific detective will employ in an attempt to increase the detective's difficulties. Evidence indeed

exists which goes to show that research in these directions is not carried out only by the guardians of law and order.

So that we may avoid a foolish complacency no less dangerous in this regard than in any other, it is well to bear this fact in mind. A relaxation of vigilance, a failure to improve, and of will to perfect methods of investigation relating to this kind of crime might well see the forger of the future in a position a great deal more secure than at present.

As to the imitative type of forgery, it may well be said that if the technique of detection has not advanced to the same extent as those just described, the disadvantage is offset by a like disability of the forger himself. There is no evidence at all that any modern forger has, in imitative skill, outdone "Jim the Penman."

And yet, curiously, this kind of forgery is more popular than it was formerly. But there has been, as we have shown, a definite advance in the methods of detection ; it is more conclusively and more speedily brought home.

CAMERA AND MICROSCOPE

CHAPTER XI

CRIME AND THE CAMERA

PHOTOGRAPHY ought to have been discovered in the early part of the thirteenth century, and it very nearly was. Roger Bacon understood the properties of the camera-obscura, but its properties were never utilized because the sensitized medium for recording the image had not been discovered. Leonardo da Vinci had studied the camera-obscura about the middle of the fifteenth century, and relating to the mid-sixteenth century there is a legend regarding the action of light on certain silver salts, the authenticity of which is dubious.

Schulze in 1727 was probably the actual discoverer of photography strictly so-called. He actually produced stencilled letters and figures. This was done by placing a solution of silver nitrate mixed with chalk in a bottle against which were secured letters cut out of thick cardboard. The parts of the bottle protected by the cardboard remained unaffected when it was exposed to light but the other parts darkened so that the letters appeared in stencil. He did not, however, develop the discovery in conjunction with any optical device.

This was left for Talbot who treated paper with salt solution and silver nitrate, and who in 1845 began to take actual photographs. Those taken by him of

Melrose Abbey and Abbotsford show that once the discovery was made surprisingly good results were quickly obtained. What we now know as the dry plate was discovered in 1848.

Its first applications were artistic, and scientific photography is a much later development. But it is probably true that except for fingerprints no discovery has been of greater importance to criminal investigation. Leaving aside for a moment scientific photography strictly so-called, the contribution it made to the technique of identification was immense. The traditional method of the Hue and Cry still remains—although the name has disappeared—a very important part of the work of detection. The description of a wanted man is issued and his photograph, if one is available. This does not apply only to criminal cases. We frequently observe in the newspapers claims that through the publication of a photograph in the Press, the missing person has been found. No description can take the place of a photograph or even a drawing, but before the advent of photography a description had to serve.

Photography as a part of the system of identification was not greatly employed until the 'eighties. In 1886 the famous Inspector Byrnes of the New York Police published his book *Professional Criminals of America*, which was lavishly illustrated with photographs. It was this eminent detective who systemized the American service of identification and compiled the first complete "Rogues Gallery." There is a very interesting photograph on record which depicts a criminal before the official photographer. He

is being forcibly held by four men. The photograph was greatly criticized as being indicative of the brutal methods used by the police. Curiously enough it has been stated on excellent authority that this was not the photograph of a criminal at all, but of a detective. It was taken with a view to demonstrating methods of holding a subject still who refused to be photographed.

Forensic photography came into general use in England about the same time, but it does not seem to have been used to any great extent in the first years of the 'eighties. In 1881, for example, an old man named Gold, living at Brighton, was murdered in the Brighton express. The struggle between the assailant and his victim was witnessed as the train passed through Horley. The actual cause of death was not the shot fired by the murderer but the fall on to the line.

Suspicion fell on a man called Lefroy from whom the police took a statement. He was detained, questioned by the police and searched, but he was not actually arrested. The police accompanied him to an address in Croydon where he gave them the slip.

A portrait of the wanted man was published over his full name, Percy Lefroy Mapleton, in the *Daily Telegraph*, and it led to his apprehension. But the portrait was not a photograph but the reproduction of a sketch by someone who knew him well and was supposed to have reproduced his facial characteristics faithfully. The portrait certainly does not flatter ; a more representative example of a completely degenerate type could not easily be found.

This, however, is by the way. Lefroy had been detained and searched, and he was under strong suspicion. But he was not photographed. This quite conclusively shows that in 1881 photography was not part of the ordinary routine.

Once established, however, the technique of photography was extensively employed in criminal investigation. Quite apart from questions of identification, it has been responsible for the solving of many difficult cases.

It is quite impossible to overestimate the extent of its applications. Perhaps one of the most striking examples of this is that quoted by Hans Gross in which an accidental snapshot resulted in the acquittal of a man accused of murder.

The circumstances were that an Englishman was accused of the murder of a Brazilian friend while both were sailing in a yacht in Rio de Janeiro harbour. The accused man had had a quarrel with his friend two days previously but they were supposed to have made up their differences. On the fatal evening the Englishman returned in the yacht with the body of his friend who, he asserted, had died by falling from the masthead. An oar was missing, and the medical men gave it as their opinion that the wound on the Brazilian's head might have been caused by such a weapon as an oar. The Englishman was accordingly arrested and committed for trial on a charge of murder.

It fortunately happened that a passenger entering the harbour on a steamship had taken a snapshot which included the yacht. When developed a black

spot was visible against the sail. This on enlargement of the photograph appeared quite distinctly as a man falling from the mast towards the deck. As a result of this extraordinary coincidence and on the evidence of the photograph, the accused man was of course acquitted.

This is a comparatively modern instance but it illustrates very well the unexpected applications and uses of photography in a criminal inquiry.

The science of photographic identification of the person has grown by degrees. In most instances it was crude enough when first employed. And at a period when taking photographs was a very elaborate and uncertain business, it is hardly surprising that it should have been less employed than it is to-day. In the first photographs in Byrne's gallery, the subject was always taken full face, and one example was considered sufficient. There was much dreadful apparatus that was a necessary part of the photographer's stock-in-trade fifty years ago. Long exposures were the rule and even the innocent victim had almost to be bound hand and foot with the head supported in an iron clamp. To photograph the unwilling subject must therefore have been an operation requiring almost superhuman patience and skill. And the wonder is not that early criminal photographs are so crude but that there are any early photographic records at all.

The next development involved at least two photographs, a full face and a profile. This is the basis of modern photographic identification. With records of this kind identification can generally be established without much difficulty.

The technique of photographic identification has nevertheless been greatly elaborated. In endeavouring to identify a photograph, it is often viewed independently in its parts. That is to say that by covering first one portion and then another, by viewing, in fact, the face in sections a much clearer idea of it for the purposes of identity can be obtained. The most highly systemized example of this principle is perhaps to be found in the Service of Judicial Identity of Paris (Method of Bertillon). There appear not only full face and profile images but photographs are recorded which represent only certain sections of the face; the ears, the mouth, the nose, the forehead, and the eyes. Special marks of identity such as the wrinkles on the forehead are thus brought into prominence.

It is difficult to realize how striking the photographs are without having seen them. Viewing the face thus, as it were piecemeal, impresses its characteristics upon the memory. It is further a curious fact that a person failing to identify the entire face may succeed in doing so by observing a section of it. The reason is that in viewing the original some detail or details have subconsciously been impressed upon the memory. They are not observed and recognized in the complete picture of the face, but when the appropriate section containing them is viewed unhampered by other elements, the points of identity are recalled.

From merely recording the person, photography came to be used on the scene of the crime, both its general aspect and the appearance of its details. There is now no serious crime committed concern-

Oreille droite *Plis et forme gén^l*

Pli inférieur (en coupe hor^{le})



PII Supérieur



Forme générale



a Fortement n



Particularities



1 BUSSA COUNCIL NAME: [REDACTED] ADDRESS: [REDACTED] CITY: [REDACTED] STATE: [REDACTED] ZIP: [REDACTED]

By permission of Dr. Ed. Locard.

ANTHROPOMETRIC PHOTOGRAPHS OF EARS.

(Identification Method of Bertillon.)

ing which the services of the photographer are not required. He must photograph the scene of the crime, and separately any details which may be important as evidence. Footprints and fingerprints receive special attention. Bloodstains, scratches upon locks, impressions of housebreaking implements, marks in dust or those left on polished surfaces, all claim the attention of the photographer.

Metric photography, particularly for small objects, is often employed. The principle is merely to place a graduated scale in the neighbourhood of the thing to be photographed so that the scale appears on the negative. Metric photography is extremely useful because in the metric photograph, if the object has been at right angles to the camera, a permanent record of its size is included in the photograph.

The camera is used more and more for making records of this kind. A triple extension camera is used with a lens of short focal length. With this instrument direct enlargement to three or four diameters can be obtained, and it is impossible to overrate the value of the evidence of an enlarged photograph.

As an example we might consider the impression of some fabric in dust, in blood, or in some other medium. The enlarged photograph is taken with the metric scale. This in itself is quite sufficient for comparison with a photograph of the original fabric—it may be the knees of the trousers of a suspect or his coat sleeve—when it is found. It is only necessary to take a photograph of the material at the same focus also with the metric scale. A count is then made of the woven threads per centimetre, and if they agree

there is a probability, and in some case certainty, of their identity.

But probably the greatest use of modern photography is the recording of fingerprints. Before a trace of this kind can be properly examined it has to be enlarged three or four times. Where fingerprints are found on fixtures it is essential to deal with them *in situ* if possible. A photograph is the obvious solution. The police of all countries use a large triple extension camera with a lens of short focal length. With apparatus of this kind it is possible by means of direct photography to produce a considerably enlarged image. Recently Scotland Yard has utilized a new and improved apparatus capable of giving high magnifications by direct photography.

Scotland Yard has probably the most up-to-date photographic department of any police force in the world. There is no modern photographic device either in connexion with photography or photomicrography which is not at its command.

Photographic evidence in connexion with documents is so useful that it might be said without exaggeration that many cases have been entirely cleared up on that evidence alone.

The investigation of the garage murder of which Podmore was ultimately convicted is an instance which, being typically illustrative of modern photographic methods, is fully worth a detailed description.

The documents concerned were a leaf from a receipt book with impressions upon it produced by the pressure of a pencil, and a sheet of carbon paper. It was required to discover what these impressions

were since they were thought to have considerable bearing upon the crime. Anyone who tries the experiment will discover that any faint indented impression upon a piece of paper will show up much more clearly when viewed in some lights than in others. Thus when the light falls directly on the impressions they will appear very faint while if the lighting is oblique the marks are much more evident. This is due to the fact that the direct light illuminates the whole impression uniformly, but with oblique illumination there is a contrast of light and shadow. It is a very important fact about the photo-sensitized medium of reproduction that the whites are whiter and the shadows are blacker than they appear in nature. This accounts for the observed fact that photographs often give a clear representation of faint marks which are not readily observed with the eye.

The method employed in these cases is to photograph the document in a dark room in such a way that the material parts of it are illuminated with a sharply oblique ray of light. This gives the maximum contrast and the maximum depth of shadow across the indentations.

The first result, however, will probably be very faint, and perhaps no more legible than the original, but special methods of intensification exist which can entirely overcome this difficulty. This first negative is intensified so that the image is made slightly clearer. A contact photograph is drawn from the negative by placing another sensitized plate or film in contact with it and exposing the plate to the light in the same way as in printing from a negative. The second

plate is developed. This will, of course, show the intensified image on the first plate. This second image is intensified, and is therefore clearer than the first. From this another negative is produced. Intensification will again increase the sharpness of the image. This process is repeated until the image is clear enough to be deciphered. The images are, of course, alternatively negative and positive, but this makes no difference since the final one can always be negative or positive at will, and either intensifies equally well. The faintest scratch or trace on a piece of paper or other surface can be made visible by this method. This ingenious device was first described by Professor Reiss who has done a great deal to develop the science of forensic photography.

In the Podmore case it was essential to establish what it was which had been written in the order and receipt books, and the indentations on the underlying sheet and upon the carbon paper were the only means of deciding this. They proved when deciphered that the orders were bogus records of sales of oil to firms who did not exist. The murdered man, Messiter, could not have made them out himself for he had no motive for so foolish an act. The police deduced that the false orders must have been the work of another person who had done this to secure commission to which he was not entitled. The conclusion was inevitable that the writer of these bogus orders probably, if not certainly, was concerned with the crime.

On the carbon sheets the initials W. F. T. were made out. Owing to the perspicacity of a police

officer who first discovered the dead body of Messiter in the garage a piece of oily paper screwed up into a ball and found by him on the floor was preserved. It was stained with oil and dirt so that it had to be chemically cleaned in the laboratory before the writing upon it could be deciphered ; but when this had been done it was found to be a note making an appointment with Messiter. The note was signed W. F. Thomas. These facts definitely associated a man named Thomas, or one who called himself Thomas, with Messiter. It was not previously known that Messiter had made any such contact in his business, and without this evidence it would probably never have been discovered.

Thomas' address was traced and a search of the rooms he had occupied brought to light another scrap of paper with the words " Podmore, Manchester " upon it. This established the connexion between Thomas and Podmore who very shortly afterwards was arrested and charged with a minor offence and subsequently with the murder of Messiter.

These documents and the photographic evidence which interpreted them were the backbone of the case against Podmore. The defence fought hard for their exclusion but they were admitted as evidence. It was these documents which convicted the accused. There is another point concerning them of great interest to graphologists and other experts. Despite intensification the letters W. F. T. were not as clear as ordinary writing, although they were legible. Among the photographic exhibits produced in court were some of the photographs in which the letters

had been carefully outlined in ink to make them stand out, but the untouched photographs were, of course, also produced. The defence again protested against the touched-up photographs being admitted as evidence. This was again overruled.

Some of the most beautiful photographs from a technical point of view which have been exhibited in any modern criminal case were those which illustrated the evidence of Mr. Churchill, the firearms expert in the Gutteridge murder.

The point at issue was a cartridge case, and it was required to prove that this cartridge case had originally contained a bullet fired by Browne's revolver. Scratches and other identifying marks on the breach shield of a revolver are always reproduced on the cartridge case around the percussion cap. In the enlarged photograph produced in which the material part of the breach shield and the cartridge case are shown together, the two exhibits were so arranged in respect of each other that it can be seen at a glance that every scratch on the breach shield shows one exactly corresponding on the cartridge case. The correspondence is as perfect as that to be obtained with a complete impression of a fingerprint. The positive evidence given at the trial that the bullet had been fired from that revolver and could have been fired from no other was completely justified.

It has already been explained that the photograph often brings out details more clearly than they appear in the original. Perhaps one of the most interesting examples of this is an instance quoted by Locard. It related to one of the most remarkable impressions

ever associated with a criminal case. It was that of the impression of the face, arms, and body of a burglar who had fallen face downwards in a heap of sand. The impression of an automatic pistol in one hand and a jemmy in the other was also to be observed. The identification, however, was not established from the print of the face or hands but by means of the size of the waistcoat buttons and the marks upon them which showed up very clearly in the photograph. It is quite common to observe in photographs of plaster casts of foot- and dog-prints details which might escape notice in the actual cast.

These instances are illustrative of some of the more important applications of photography to criminal investigation. There are many others, and in fact the camera is brought into use at every stage and in almost every kind of forensic inquiry. Its use in forgery has been described elsewhere; in conjunction with the microscope it is able to illustrate the machinery of certain kinds of scientific investigation which could not otherwise be made clear to the layman.

In this connexion a word ought to be added regarding the uses to which cinematography can be and are being put by the detective. It is a curious fact that the anarchist assassin who killed President McKinley was cinematographed *in flagrante delicto*. The President was visiting the Buffalo Exhibition and a number of cinema men were, of course, present. After the tragedy when the films were being developed an examination of some of them revealed the fact that the incidents leading up to the tragedy had been reproduced. The murderer, Czolgosz, was clearly

recognized—his face was then turned towards the camera—on the outskirts of the group around the President. The film portrayed him elbowing his way through the group, and he twice faced the camera in his passage towards McKinley, and was clearly recognizable. He showed signs of great agitation. The police carefully examined this film with a view to the possible discovery of his accomplices.

There is no doubt that a cinematograph picture of a riot would often be of immense value in the subsequent proceedings. During such a disturbance the evidence of eye-witnesses is not of much use, but the camera, having no feelings, dispassionately records. And what is more important it records everything within its range, and there can be no doubt as to the order of events, even if some exists regarding the identity of those who take part in them. It is obviously impossible to identify with certainty a person who does not once turn his face to the camera.

The cinema has other uses to which it is now in some instances being put in France. In cases where a reconstruction of a crime has to be described, a cinematograph record now often replaces an explanation which may have to be long and elaborate, and which the court, therefore, may find difficult to follow. A re-enaction of the affair on the screen is an almost ideal solution of the difficulty. Although not frequently used up to now, it has been employed occasionally in French trials with great success.

Photography has not been applied to criminal investigation for much longer a period than fingerprints. Its triumphs are perhaps less spectacular and sensa-

tional than those which attended and followed upon Hershel and Galton's discovery. But quietly and silently photography has done and continues to do its work, and without it, as we have shown, many criminals might have escaped unpunished.

CHAPTER XII

CRIME AND THE MICROSCOPE

THE use of the microscope and of the lens in criminal investigation is not so recent as has often been supposed, but it was regarded for a long time with a great deal of suspicion by the law and the police. The detective stories of Conan Doyle are regarded as excellent romance. But like many good romances they are founded upon some very interesting fact. Conan Doyle was a medical man and besides this he had had some medico-legal training. For those who read them aright, the Sherlock Holmes detective stories are a kind of historical and critical survey of criminal investigation. The difference of opinion which arose between Sherlock Holmes and the police typified in some degree the conflict between the traditional methods of investigation and the new scientific methods to which Hans Gross has drawn attention as far back as 1880 and which were being enthusiastically studied on the Continent. Many of the cases of Sherlock Holmes, if not all of them, are founded upon fact, and some are literally historical romances.

The regular police in most of the detective stories are represented as laughing at Sherlock Holmes because he employed a lens in his investigations, and in discussing with Watson the detection of a coiner

by the microscopic examination of the metallic dust in the sleeves of his coat Holmes remarked that he had at last succeeded in convincing the police of the uses of the microscope.¹ This again has quite definitely an historical background.

Although the lens and the microscope have been used in criminal cases since the beginning of the nineteenth century, the prejudice against these aids to the eye is a matter of historical fact. This is the more curious since of the applied sciences that of optics is perhaps the most ancient. As far as the West is concerned microscopy began in the seventeenth century, and everyone knows that Spinoza was a grinder of lenses.

But the early microscopic apparatus did not approach the modern optical instrument in efficiency. The material from which the lenses were made and the method of grinding them were crude. There was aberration and distortion in the magnified image which made it rather a dangerous guide for the uninitiated.

But the prejudice remained after the grounds for it had disappeared. Even one hundred years ago, judges were greatly biased against the evidence supplied by the lens.

In the case of *Robson v. Rocke*, Sir John Nicholl had some very critical observations to make on the use of the lens for detecting fraudulent manipulation of a document. He declined the use of one himself, and observed that lenses often tended to distort the object seen under them. And he had some very

¹ *The Case Book of Sherlock Holmes*: "Shoscombe Old Place."

caustic things to say on the subject of their use in the hands of prejudiced persons. It was not only prejudice against the lens that influenced the learned judge in making this pronouncement; it was also prejudice against the expert witnesses. In this he may have been perfectly justified.

But as an earlier case shows this point of view was not universal. In 1818 a woman named Hodges was tried at Warwick for setting fire to some hayricks. The important clues left on the scene of the crime were a tinder-box, some pieces of cotton rag, and part of a neckerchief. A lens was used in this case quite in the modern manner. The cotton was scrutinized with it, and it was said to correspond exactly with the piece of cotton found in a box belonging to the accused. The piece of the neckerchief was similarly examined and was pronounced to be the same material as one found at her lodgings. This was decided by the breadth of the hem and the distance apart and size of the stitches. Further, the neckerchief was hemmed with silk said to be identical with the silk of the neckerchief. This fact was of considerable importance since it was stated that such things were generally sewn with cotton. It was deduced that the hemming on the two pieces of material was the work of the same person. Hodges was convicted but reprieved on account of the state of her mind.

This, however, is probably an isolated instance. The prejudice against microscopic evidence persisted for many years. But this was partly due to the advances made in microscopic technique in the middle

of the nineteenth century. Although alike in principle there is in practice a great deal of difference between the lens and the microscope. Almost anyone can make use of a lens, but the manipulation of a microscope is a much more difficult matter. A person unaccustomed to its use is quite unable to appreciate its revelations.

In earlier times when scientific evidence was not so common a feature in judicial proceeding as it is now both judge and jury were inclined to suspect evidence which they could not examine for themselves. This position actually arose at the trial of Nation, to which allusion has elsewhere been made. Had the judge himself been able to examine the microscopic appearance of the blood corpuscles, and understood the principles of measuring them, he might not so readily have dismissed the expert evidence as "scientific speculation." In this particular instance the judge was perhaps right to warn the jury, but his caution was the effect not of an understanding making him able to weigh the pros and cons, but a fear of the unknown.

By about 1880 the prejudice was beginning to disappear. The Orrock case was one of the earliest examples of a triumph for microscopy, for it was upon this evidence that the author of the crime was traced and convicted.

On December 1st, 1882, a young policeman named Cole was on duty in Ashwin Street, Dalston. There was a thick fog. The officer, however, was passing a Baptist chapel in front of which was a wall, and he saw a man clambering over it. Cole called upon

him to come down and since he did not answer he pulled him off the wall and endeavoured to take him in charge. In the struggle the officer had almost overcome his prisoner, but seeing that he was getting the worst of it, the man drew a revolver and fired three shots. Two missed, while the third entered the constable's truncheon-case.

A woman who could see nothing but who had heard the shots ran to get help. She returned with two constables, but in the interval a fourth shot had been fired which killed Cole. The murderer escaped in the fog, and he could not be traced.

On the scene of the crime there were found a black felt hat, two chisels, and a wedge. A bullet was extracted from the truncheon-case, and one was drawn from the constable's brain. There were no other clues.

A careful examination of the chisels revealed some scratches on the blade of one in the region of the unsharpened part which joined the wooden handle. With the naked eye these appeared to be haphazard marks, but under magnification they were found to be letters which spelt "Rock." Inspector Glasse, who was in charge of the case, came to the conclusion that this might have some connexion with the owner's name.

An intensive search of the tool- and cabinet-makers, manufacturers, and others connected with tools in and around Dalston was organized. It was continued for a year. The official patience was then rewarded by the discovery of a woman named Preston who had carried on her late husband's business as a tool-



By permission of Cassell and Co

ORROCK'S CHISEL.

(The name scratched on the base of the blade provided the clue.)

From the Black Museum.

sharpener. She thought she could identify the chisel which, she said, would have the name scratched upon it if it had been through her hands. Upon its being pointed out to her, she identified the mark as being hers. The word was actually "Orrock." She remembered that he was a carpenter and that he had brought the chisel to be sharpened a considerable time ago. Preston had not seen Orrock recently.

A microscopic examination of the chisel was now made and it revealed that what appeared to be a roughly scratched "R" was in fact an "O" with a small "r" very close to it.

Orrock was known to the police and he was traced to Coldbath Fields prison where he was serving a sentence for burglary. It was thought that he had deliberately sought arrest, believing that he would be better concealed in prison. A great deal of additional evidence was obtained from some of his associates who gave information. Proof of the purchase of a dark lantern was discovered, and of a small pin-fire revolver. It was asserted that he had actually practised with this by firing at a tree in Tottenham Marshes. A search was made and the bullet recovered from the tree. The case was absolutely complete. Orrock was tried, found guilty, and executed.

This is a straightforward example of a mystery which was solved by means of the microscope. The whole case turned upon the deciphering of these scratches. Without this preliminary but vital piece of information it would have been quite impossible to trace the author of the crime.

Strictly speaking, however, it is doubtful if this

should be called microscopy, which in the modern sense means the examination of objects which are invisible to the naked eye. It is in this direction that the technique becomes really expert. To use low-power microscopy is to employ an exaggerated form of lens. The image is merely enlarged without being changed in visual form. High-power microscopy is not like that. The appearance of two white powders such as plaster of paris and starch is an example of what is meant. They appear very much alike under the naked eye, and even under low-power magnification, although some difference would be noticeable, it would not be well defined. Under a high power the differences are pronounced. The plaster of paris will appear as monoclinic crystals, the starch as small colourless spheres which will vary in size according to the type of starch.

High-power magnification thus becomes of very great value as a means of identification. All starches can positively be identified by microscopic examination alone. This method is, in fact, employed every day in the laboratories of analysts engaged in the detection of fraud relating to foodstuffs. In a sample of flour (wheat starch) adulterated with, say, potatoes, the admixture can immediately be detected since the spherical form of potato starch is much larger than that of wheat.

Mustard and pepper have often been adulterated with foreign starches which can be detected in this way although, of course, confirmatory tests are also applied. But it is true to say that the microscope is a most efficient instrument of detection for this

kind of fraud. The astonishing reduction which has taken place in the fraudulent adulteration of food is so well known as scarcely to need remark. The microscope has had a great deal to do with this.

The identification of crystals is not so simple, nor in all cases so precise, but very interesting work has been done in this connexion. Here it must be explained that all crystals, and therefore those substances which exist in crystalline form, fall into one of seven groups, the cubic, the tetragonal, the hexagonal, the rhombohedral, the rhombic, the monoclinic, or the triclinic. A description of these forms hardly falls within the scope of this book. It will suffice to say that these seven forms are characteristic and can be distinguished from each other. Obviously certain identification is not generally possible merely by an observation of the form of the crystal, but it narrows the field of investigation.

In some cases identification is possible, however. An example of this occurred in 1884. In this affair it was suspected that atropine had been administered, and no method of detecting this alkaloid with certainty was then known. The suspected extracts containing the alkaloid were treated with a view to producing an appropriate crystalline form, and a photomicrograph was taken of these crystals. It was decided from their form and size that they were crystals of atropine, and they agreed exactly with those produced from pure atropine under similar conditions.

This was perfectly sound procedure in the domain of higher microscopy. As a result treatises on toxicology about that date describe micro-methods of this

kind for the detection of alkaloidal poisons with photomicrographs illustrating the form of the crystals obtained in varying circumstances and with different alkaloids. It was discovered that appropriate salts of these substances did form characteristic crystals which provided a means of identifying the various alkaloids.

With organic substances preparations can be made which produce highly characteristic crystalline forms. This method is not now much employed for the detection of alkaloidal poisons, but it has recently been restudied in connexion with the identification of minute traces of various substances, and there are circumstances in which it gives more satisfactory results than any other method.

In a related connexion, this micrographic technique was employed for the physiological examination of blood. One method was to mix the blood with a solution of salt and then to add acetic acid. Small crystals of hæmatin hydrochloride can be detected under the microscope. They are flat and rhombic and in colour dark violet. In size they vary with the origin of the blood.

A more recent method is to replace the salt with potassium iodide. The test is carried out on a microscopic slide and the crystals examined. They are small and dark red in the case of human blood, and their size varies with the origin of the blood. This method is still being investigated. It is hoped that a method of performing the test will be found by which it is possible to identify by the size of the crystals the origin of the blood. It appears that the blood of different animals may all show crystals of the iodo-

hydrate of hæmatin sufficiently characteristic to identify them if the test is carried out under standardized conditions.

The microscope has been in the past, and still is, a very important factor in the examination of blood. Apart from the detection of the corpuscles, a certain indication of the presence of blood, all the hæmin and hæmatin reactions which rely upon the formation of crystals are micro-reactions. Before the discovery of Bordet's test these micro-crystalline tests were the only ones available. And while they were less conclusive in the matter of the origin of the blood than are the modern biological tests, in their day they represented a valuable addition to the study of blood-stains from the forensic point of view. They have not even now by any means outlived their usefulness, and it is not at all improbable that a test based on these classical reactions will be evolved which will give information regarding the origin of blood—whether it is human or animal—with absolute certainty.

The microscopic examination of fingerprints has opened up entirely new possibilities in the matter of identification. From the very beginning fingerprints were always enlarged for the purposes of examination; but the reason for this was merely to facilitate the observation of the papillary markings. It has already been observed that this made the pores visible, but it was not then supposed that they provided a means of identification.

Higher magnification came as a revelation. The size, shape, and position of the pores could be studied in the photomicrograph with the result that the tech-

nique of poroscopy has become a part of the fingerprint system.

But microscopy has also made possible the investigation of other identifying marks. We are bound to accept the ancient theory that the lines on the hand are a guide to character *cum grano salis*. Palmistry has no scientific basis. But the use of palmistry as a means of identification provides a promising field of research. M. Claps of the Police Laboratory of Lyons, who has been engaged in an examination of marks of identity other than fingerprints, has investigated this question.

There seems to be evidence that goes to show that these lines can often be identified. High magnification assists in establishing points of identity. It appears to have shown quite definitely that where all the lines on the palm are available, identity can be established with certainty. This, however, is very rarely the case. The print to be dealt with will be fragmentary as in the case of many fingerprints. But these lines even in a restricted area sometimes show highly characteristic configuration which can be identified.

Magnification reveals characteristics invisible to the naked eye ; the structure of the lines, breaks in continuity, branching, and pitting.

This is a good example of the uses of modern microscopy in the service of identification. A mark of identity is not necessarily less characteristic because it is microscopic. The essential condition is that it shall supply a sufficient number of points available for comparison.

Fibres can frequently be identified by means of the microscope. Minute fragments are amenable to examination as readily as larger pieces. Silk, cotton, linen, and hemp have quite characteristic appearances under the microscope which enable them to be identified with certainty. When a small fragment only is available it is often difficult to decide the exact shade of the fibre. The microscope reveals this clearly. Gradations of colour show up much more clearly under the microscope.

In the Wildthal affair, already quoted, the minute fragments of silk under the fingernails of the suspect could not have been identified and compared with the silk cord with which the murderer's victim had been strangled without microscopic examination, both to decide the nature of the fibre and its exact colour, red and blue. Colour is, of course, a very useful aid to identification, and special comparison microscopes as they are called have been invented in recent years to facilitate the comparison of colour of microscopic objects. These are arranged with two objective lenses side by side, a prism box, and a single eye-piece. With this arrangement two objects can be viewed side by side and compared in colour. This instrument is now almost indispensable for the comparison of the colour of ink writing on documents, fragments of fibre, and similar small clues.

In the case of letters which have been tampered with, small fibres are sometimes found sticking to the sealing-wax or in the flap of the envelope. Their origin will often be the clothing of the suspected person. There is not, I think, a case on record where

a conviction has been obtained on this evidence alone, but it has often formed one of the strongest links in the chain leading to a solution of the problem. In one instance two minute fibres which appeared black under the naked eye were identified as dark blue wool under the microscope. These were compared with the material from the sleeve of an individual suspected of having handled the envelope. In this particular affair nothing more than a strong suspicion was established, but this does not reduce the value of the investigation. It achieved what it set out to do in identifying beyond question these minute fibres adhering to the sealing wax.

These optical instruments of comparison are among the most recent weapons which have been added to the armoury of scientific detection. There are other forms of the comparison microscope used for other purposes. Of these the hastoscope devised by Dr. Locard is perhaps the most important. This is designed on the same principle as the comparison microscope, but it is adapted for the examination of bullets.

When it is desired to decide if a bullet has been discharged from a particular firearm a comparative examination of the marks in it due to the rifling of the barrel is the best method if the bullet is not distorted. The suspected bullet and the one for comparison are fixed into the special attachments on the hastoscope, and similar regions of the two bullets are viewed through the eye-piece at the top. There are micrometer screws on the attachments holding the bullets so that they can be turned round and the actual grooves due to the rifling measured.

Provided the bullet is not distorted, it is always possible to decide by this method of microscopic comparison if a particular projectile has been discharged from a particular firearm. It is the accepted method of examination and has been responsible in innumerable cases for the identification of bullets.

Microscopy has thus grown from the elementary technique of the use of the lens to the employment of the modern instrument with its searching and exact scrutiny. It is legitimate to describe it as exact first because the modern instrument does reproduce an exact image, however greatly magnified, and secondly because micro-measurement often makes possible the mathematical comparison of things invisible, or unrecognizable in their details and dimensions, to the naked eye. The measurement of threads and hairs is quite definitely a matter for exact determination and is, of course, the same in principle as any other kind of measurement. Any evidence ultimately relying upon mathematics is finally conclusive because it is entirely objective. It has been observed that the breadth of hairs and fibres, the number of stitches in a piece of woven material per centimetre, the dimension of grooves and other marks upon bullets form a definite part of the technique of identifying these things. Much of this work could not have been done at all in the early days of microscopy and none of it could be carried out with the great accuracy which is the rule to-day. The measurement of the blood corpuscles is an example where really accurate results belong to the last twenty years, owing to the improvement in optical instruments and devices for micro-measurement.

It is interesting to notice in this connexion also how improvements in microscopy as it is concerned with criminal investigation turn upon the matter of identification either of the person or of some object connected with him. From the point of view of circumstantial evidence that is the principal function of science ; to devise new and more refined methods for identifying a trace or an object likely to be connected with a crime, and to isolate and fix those characteristics about it which will definitely connect it with one individual as distinct from all others.

CONCLUSION

CHAPTER XIII

CHEMISTRY IN THE SERVICE OF CRIME

IT is a matter of historical fact that poisoners have, if not a more successful, at least a much longer record than detectives. This accounts for the element of mystery which surrounds so many of the early poisoning trials. The affair of Sir Thomas Overbury has never been satisfactorily cleared up. The Borgia poisonings are equally or more mysterious, and the examples of death during the Middle Ages and the Renaissance where there was suspicion of poisoning are so numerous as to make it evident that no means of detection existed. This was not due to the fact that the knowledge of poisons was elementary. It was, on the contrary, very far from it. There was an art of poisoning. Entirely empirical, a great deal of experimental knowledge was at the back of it. Toxicology was then, as it still is now, a branch of medical science. But medical technique was entirely empirical. It studied effects; the causes had to be squared with current theological and philosophical theories. So it was with poisons. They were carefully compounded according to definite recipes, their effects were very well understood, but the causes of their lethal action were not understood and were not studied, the theory being that the toxic properties were associated with magic.

This profoundly affected the legal and criminal attitude. It made matters easy for the clever poisoner who had learnt from some not too scrupulous apothecary or alchemist how to brew and distil noxious draughts from the weeds and roots of the field. A victim died suddenly, and the word poison was whispered; but so closely associated were toxicology and witchcraft, that in any given case the latter might be blamed equally with the former. Serious investigation in such circumstances could not be made. The clever poisoner had things his own way.

On the other hand, the law punished with barbarous ferocity those suspected of poisoning. At as late a date as the end of the reign of Henry VIII a woman was boiled in oil in Cheapside for poisoning her husband. She was unquestionably guilty, but many who endured the same fate were not. Even in the late sixteenth century, a sudden death from no assignable cause—not an uncommon occurrence with medicine and surgery in so rudimentary a state—and a whisper of poison and magic might result in a trial with torture and execution. To quote the seventeenth-century instance, Anne Turner, in the Overbury case, was executed rather on suspicion as a witch than on account of any proof that she was a poisoner. Even allowing for the belief in witches there was no real evidence of witchcraft, but there were rumours of it, and that sufficed.

With such a point of view and habit of mind, it is not surprising that poisons should have been studied for hundreds of years only from the point of view of the effect of their administration and not at all

from that of their detection when they had been administered.

On the other hand, autopsies were sometimes performed when poisoning was suspected, and opinions given as to the cause of death. In the latter part of the Middle Ages the knowledge of physiology of the better sort of surgeon was at least sufficient to allow him to recognize inflammatory conditions of the alimentary track which, if the deceased had previously been healthy, would suggest the ingestion of a poison. At the same time, the fantastic nature of the reports made by surgeons who had conducted post-mortems even in the seventeenth century suggests that their imagination often made shift to remedy the defect of their science. The surgeons' report in the Brinvilliers case quoted in the first chapter is an example.

The belief that poisons were agents which worked in a mysterious way endured much longer. Again, however, to quote the Brinvilliers case, the examiners reported of the poison that it was a mysterious agent which, when used to poison small animals, left no traces of its presence. This does no more than suggest that they found no poison because they did not know how to look for it. It was further a relic of the theory of magic which persisted even well into the eighteenth century. Mary Blandy, who poisoned her father, is supposed to have believed in the efficacy of love philtres, though as to whether this confession is to be taken as evidence of superstitious naïveté or as a mark of sinister guile will depend upon the point of view from which we regard Mary Blandy herself.

However this may be, it remains true that chemistry as it was understood in its early days, and as far as it was concerned with toxicology, was employed in the criminal rather than in the legal interest. Glaser, one of the accomplices of Brinvilliers, was something of a savant in his way. He had written several treatises on chemistry; but his actual trade was in poisons, and Brinvilliers was probably by no means his only customer. Nor is Glaser an isolated example. His infamous profession was a recognized evil of the seventeenth century.

Even in the eighteenth century the advantage was with the poisoner. The superstition was fast disappearing, but the indirect effects of it remained. Almost nothing was known about the detection of poison, but the arts of preparing it had not disappeared or fallen into disuse. Even in the early nineteenth century before the rise of Orfila, father of modern toxicology, it is said that the methods of preparing arsenic as used by the Borgia and the Medici were still in use. Some of the reports as to the fantastic powers of these poisons were current, and it is said that even Vidocq believed them. Here is evidence that poisoning as a profession and an art died very hard, and the conviction as to its magical powers hardly less easily.

This explains the fact that there are very few important eighteenth-century poisoning cases which have been entirely free from a doubt that the accused were not guilty of the crime imputed to them, and it is certainly true that many of those accused were convicted upon evidence which would not now be

accepted as sufficient. This was, of course, largely on account of rudimentary methods available for examining the *corpus delicti*. There were, however, often other circumstances which point to what can only be described as carelessness unjustly tempered with prejudice against the accused. The affair of Kitty Ogilvy is one such.

But of all these affairs, the Boughton murder is perhaps the best example of how at that time the technique of poisoning was much better understood than the technique of detecting it. The fact that the accused was convicted does not invalidate this conclusion. On the evidence it is doubtful if he should have been. Absolutely conclusive evidence of poisoning was lacking, largely on account of the lax manner in which the investigation was conducted.

Captain Donellan strongly suggests the evils of a past century. He was interested, as were the chemists of the seventeenth century, in the study of poisons. In his room was some chemical apparatus which included a still ostensibly used for the distillation of rose water. Donellan also possessed large quantities of arsenic which he employed apparently for poisoning fish.

He was the brother-in-law of Sir Theodosius Boughton, a young baronet. The young man was living at the time of the tragedy, 1780, at Lawford Hall, Warwickshire, with his mother, sister, and Captain Donellan. The sister who had married Donellan in 1777 was to inherit her brother's property worth some £2,000 a year if he died childless.

Boughton seems to have been suffering from some

slight disorder which his doctor did not regard as serious. But in the August of 1780, his medical man was prescribing for him some simple draught containing jelap, lavender water, and nutmeg. On the 30th of August he was still taking this medicine but he was quite well enough to attend to some business at six o'clock on the morning of that day. He took some medicine at seven o'clock which he complained had a disgusting taste. It was deposed at the trial by Lady Boughton, his mother, that in two minutes or less he was in violent pain and convulsions. He recovered slightly, but in five minutes he was much worse. The doctor was hastily summoned, but in spite of his efforts the young baronet died very soon after his arrival.

Lady Boughton was under the impression that there had been some mistake with the medicine. In this connexion Donellan's behaviour invited strong suspicion. Knowing this, he yet poured the contents of the bottles away and washed them out. He afterwards removed all the bottles. Further, when notifying Sir William Wheeler of the death of his ward, Donellan made no mention of the circumstances attending his decease. Sir William in his reply suggested that since rumour was afloat the matter could not be satisfactorily settled without an autopsy. He concluded by saying that it was commonly reported that his ward had died either from the medicine or by poison.

Donellan agreed in regard to the autopsy, and two doctors were summoned and asked to perform it. But they were not told for what reason the autopsy

was required, and it appears that they did not open the body. Sir William, hearing of this, despatched two other doctors who arrived on the day of the funeral, but through a misunderstanding for which Donellan was responsible the autopsy was not performed.

Owing to the growing rumours, however, the body was exhumed, and opened. One of the doctors who performed the post-mortem declared that the condition of the body was consistent with poisoning, but John Hunter, the eminent surgeon, who was the other examiner refused to admit that there was any evidence of poison.

The rumours centred round the discovery that Donellan had a private still in his room, a fact which either was unknown, or was thought to be of no significance until the tragedy occurred. It was further noised about that he had distilled laurel water in it. This was never definitely proved, but was founded on a piece of evidence which never emerged at the trial. In Donellan's library a copy of *Philosophical Transactions* was found. Only two pages of it were cut, but these related to a method of preparing laurel water. The only other evidence which might or might not have been significant was that a little before the murder Donellan had had the still washed out, and that it had contained wet lime.

It was well known at this time that laurel water was extremely poisonous, but whether it was understood that the active principle was hydrogen cyanide does not seem to be clear.

Laurel and many other leaves and plants contain hydrogen cyanide (prussic acid) in considerable quan-

tity either in a free state¹ or by reason of the hydrolysis of a substance known as amygdalin. When the leaves are soaked in water this amygdalin is fermented (hydrolised), producing prussic acid, benzaldehyde, and a sugar (dextrose).

There is no doubt at all that the symptoms accompanying the young baronet's death were consistent with prussic acid poisoning. Donellan had a still, a piece of apparatus necessary for producing from laurel water a sufficiently high concentration of the deadly acid. Lady Boughton deposed that the medicine her son took smelt strongly of bitter almonds. Captain Donellan had disposed of the bottles which had contained it, he had given misleading information to the young baronet's guardian, and he had done his best to prevent an autopsy. This very damning evidence suggested guilty knowledge.

But the post-mortem evidence was mere guesswork. The first doctor, after complaining that the advanced state of decomposition of the body made any conclusion difficult to arrive at, then proceeded to state most positively that death was undoubtedly due to laurel water. He founded this assertion upon the fact that Lady Boughton had noticed that the medicine smelt strongly of bitter almonds, a grossly improper observation for an expert witness to make since this was hearsay evidence. He had noted that the smell emanating from the remains was of a particularly acrid nature and similar in its effect on the senses to that which he had experienced in dealing with laurel water itself. This was most unsound. The hydroger

¹ Prussic acid exists in laurel leaves in a free state.

cyanide, if it were present, might have partly decomposed after this length of time and produced ammonium formate. This substance has an acrid smell, but a relatively enormous quantity would require to be present for the doctor to have detected it with his nose, and for it to have produced the effect upon him he declared it did, having regard to the odour of the remains. The unfortunate young baronet can hardly have consumed so large a dose of laurel water as that. Again, the odour of the remains would not, after that length of time, have resembled the smell of the original laurel water as the witness asserted it did. He had further already admitted that the original laurel water smelt of bitter almonds. The fact was that this witness had already formed an opinion on the basis of the other evidence which was admittedly strong enough, and his imagination operating, no doubt subconsciously, did the rest.

John Hunter, the surgeon, more eminent and more cautious, contented himself with testifying that the condition of the body was such that no definite opinion could be expressed, but there was nothing in his view which was inconsistent with death from natural causes.

It should be mentioned here that the only sound piece of expert evidence given was the effect of laurel water upon rats and mice to whom it had been administered. It was found that they had convulsions and died, and that upon opening them a strong smell of laurel water was noticed.

This was reasonable. The smell of bitter almonds is nearly always noticeable in cases where there has

been poisoning with prussic acid if the remains are not in an advanced state of decomposition. Even when the odour of decomposition is present it can still be detected by an experienced nose so long as it remains undecomposed.

The substance of this medical evidence has been quoted in some detail in order to show that far from helping to clear the matter up it was a confusing element in the case. John Hunter had formed no opinion and was honest enough to say so. The evidence of the other medical man was sheer nonsense.

This does not show that John Donellan was innocent. There is, on the contrary, the strongest possible presumptive evidence that he was guilty, and there is no very good reason to quarrel with the verdict of guilty which was returned. But the case does show that the expert poisoner understood his business a great deal better than the expert witness in that year of grace 1780. The scientific evidence—the adjective is perhaps an undeserved compliment—certainly did not prove that laurel water had been administered to Sir Theodosius Boughton. The presumptive evidence strongly suggested that it had, or at least that the accused had administered some noxious substance to the baronet.

But it was one of those instances in which it was really vital to show first that a noxious substance had been administered, and, secondly, that that substance was laurel water. Having regard to the nature of the medical evidence it is hardly surprising that a large body of opinion held that the prosecution had proved neither.

Modern toxicology would, of course, have been able to detect the poison if it were present in spite of the condition of the remains, and would thus have been able to clear the matter up at least so far as the administration of the poison was concerned. This was quite definitely the issue. The defence was that no poison had been administered to Sir Theodosius Boughton, but that he had died a natural death.

It is a fact to be borne in mind that prussic acid had been discovered in 1780, and that some of its properties were understood. Means of testing for its presence were probably known, so that a toxicologist who was enterprising enough would probably, even at that time, have been able to demonstrate its presence in the body. It should in any case have been possible to have made an extract from the stomachic remains and tested its effects upon an animal, an empirical method still employed in the examination of some of the rarer alkaloids, notably aconitine.

Even to-day the "mysterious poison" has a certain sinister but romantic flavour for us. It is a relic of the superstition which associated poison with magic. In the eighteenth century it still retained a definite vogue, however ashamed the more enlightened might have felt in admitting it. This perhaps does something to explain the fact that although a great deal more was known about the commoner poisons and their effects at that time than is generally realized, that knowledge was not applied to the extent it might have been in convicting those guilty of poisoning, or in acquitting those wrongfully accused of it.

Turning from murder to other forms of crime, it is worth remarking here that considerable knowledge of chemistry and metallurgy is essential for the successful coiner. There is no doubt at all that in the eighteenth century, and well into the nineteenth, chemistry in this respect did a great deal more for the criminal than it did for the detective.

Towards the end of the eighteenth century there were at least forty private mints at work in London, while some country towns literally produced showers of false money, and at the Mint the names of not less than 650 coiners were registered. Coining was a trade, and a very prosperous one, employing large numbers of workmen.

From a technical point of view the fabricated coin was excellent. In the case of gold, sufficient of the precious metal was alloyed with the base to make it very difficult to detect the fraud. The silver coinage was not always so carefully counterfeited, but even this grade of money was often fabricated with great skill.

The difficulty of detection in note forgery and coining remains to some extent to this day, but the problem was much more formidable in the eighteenth century. The public had no means of distinguishing between good money and bad, while bank officials and others were themselves deceived. Not only did they often fail to detect counterfeit money, but they not infrequently refused to accept the genuine. Great Britain was in any case on the edge of a financial crisis, and the unprecedented spread of this type of fraud did nothing to mend matters.

Forgers of notes were equally if not more expert. It is unquestionable that no modern counterfeiter of notes has surpassed Charles Price. Price was quite in the first rank. He used special paper which was correctly watermarked by his own process. It is even said that he manufactured the paper, and there is no doubt that he made his own printing ink. Price was further a first-class engraver, and the notes he produced were quite undetectable except by experts at the Bank of England.

In this kind of fraud chemistry is seen to play a great part, while it had very little in the machinery of countering it. Once suspected, arrested, and tried there was generally very little difficulty in establishing the coiner's or note-forgers' guilt, but in the matter of forgery it is not only the apprehension of the authors which is necessary but their apprehension with the least possible delay. From an economic point of view, the coiner and note-forgers are the most dangerous of all criminals.

In the twentieth century, the existence of forty private mints in Great Britain would be impossible. Metallurgical analysis of the coins would detect the existence—and with the help of other information—the location of those mints. No two coiners would employ exactly the same alloy. But the crude tests applied to counterfeit money in the eighteenth century were not such as would distinguish one type of well-fabricated coin from another. In many instances also, while it might have been a simple matter to uphold a prosecution for uttering false coin or notes, it must have been much more difficult definitely to

establish counterfeiting as well. For this reason very little distinction was made between forging and uttering, and it is hardly an exaggeration to suggest that the mere possession of a forged note by an innocent party might at that time have resulted in his life coming to a premature end on the scaffold.

Forensic chemistry could at that time do nothing to prove that a particular individual was responsible for the counterfeiting of a particular coin. The only evidence of any value was the discovery of the moulds and metallic matter used in the coining process together with the proof of possession.

The apparatus for producing counterfeit coin is not elaborate. Essentially there are required only small plaster moulds with the impression of a genuine coin, reverse and obverse, which fit together, the fusible alloy, a few files, and a crucible. These things are easily disposed of at the first breath of an alarm. If they are not discovered conclusive evidence of counterfeiting is extremely difficult to establish. It is not surprising that in spite of the drastic penalties, the eighteenth-century coiner flourished, and often carried on his trade for many years quite unmolested.

Things are not quite so easy for the coiner now. An analysis of the coin is made, and if a suspect is arrested a careful examination of the dust in his clothing follows. Metallic dust may be, and often has been, discovered which, on an analysis, has proved to have substantially the same composition as the alloy of which the coins are composed.¹ In such a situation denial and a failure by the police to discover

¹ See *Some Persons Unknown*, by Henry T. F. Rhodes.

the counterfeiting apparatus will not much help the accused.

It was not until later that chemistry became the ally of the expert manipulator of documents other than monetary notes. About 1830, however, Chevalier was carrying out work on the chemical examination of suspected documents, and forgers were beginning to discover that certain chemical agents were a much more suitable method of removing ink writing from paper than the old-fashioned crude process of scratching the paper with some abrasive material. But by this time the chemist detective was becoming alert. He was experimenting with forgery and forestalling his criminal rival, and he discovered very soon that for every chemical reagent the forger could employ to bleach the writing from a document, there was another that would bring that writing back. More than a hundred years ago it was known that faded writing on a document or that which had been bleached so that it could not be read could again be made legible by treatment with potassium ferrocyanide—which turns the residual substances of the ink left on the paper blue—or ammonium sulphide—which turns them black.

In this aspect of the turning of chemistry to criminal uses, and to those of detection, the honours have been on the whole with the detective. But it is only in respect of the last fifty years that this assertion can safely be made. It certainly was not true in 1857, the period when James Saward, known as "Jim the Penman" flourished. The full extent of his depredations was not at the time, and never will fully be

known, but he was probably the most skilful forger of cheque signatures who has ever lived. It is an interesting speculation to consider how many of the instruments he forged could have been irrefutably proved to be counterfeit had they all become available for examination by the methods employed for the detection of forgery in the middle of the nineteenth century. It is quite possible that eighty per cent. of them would have been declared genuine. The methods devised by Chevallier had hardly emerged from the seclusion of the laboratory. Their importance was realized by the scientist, but it was not until many years later that they came to be employed in practice.

It is still legitimate to speculate as to whether the trained scientific man could produce the perfect forgery. Chemistry is of use to the forger, but he has always remained an amateur of that science. His resource is not equal to that of the trained laboratory worker whose everyday occupation consists in the recognition and solution of new problems. On the whole, however scientific the forger, the scales are weighted in favour of the detective.

This perhaps explains why the chemist does not often figure in the criminal records as a practitioner either in forgery or other crime. Chemists do not shine as criminals. It is indeed a remarkable fact that one of the clumsiest murders ever committed was the work of a chemist.

Dr. Webster was a professor of chemistry in the Grove Street Medical College, Boston, in 1850. He was a scientific man of some attainments with a reputation as a lecturer. His life, however, was not a

happy one since he lived beyond his means and perpetually in debt. He owed money in every direction, and Dr. Parkman, a medical man and a friend of Webster's, was his creditor for a considerable sum of money. The security was a mortgage which Webster parted with without Parkman's knowledge. This produced a letter of strong remonstrance from Parkman. In reply he received a letter from Webster inviting him to call and see him. Dr. Parkman was seen to enter the college at 2 p.m. on the afternoon of the appointment, but he was never again seen alive.

Webster when interviewed declared that Dr. Parkman had called upon him at his invitation since he wished to repay a debt. He was anxious to prove that Parkman had been seen in Boston after the interview, and to bolster up this suggestion he adopted the clumsy expedient of writing anonymous letters to the city marshal purporting to show that Parkman had in fact been seen after the interview.

But this was not so clumsy as the crime had been. Dr. Webster had killed Dr. Parkman with a blow from a hammer. He had then endeavoured to destroy the body by burning it in a furnace in his laboratory. Only part of the corpse had thus been destroyed. The trunk was found in a chest. Identification of the doctor's body was achieved by the discovery in the furnace of a set of false teeth which had remained uncalcined. They were sworn to by the dentist who had made them as those of Dr. Parkman. The circumstantial evidence was so strong that Dr. Webster was very quickly found guilty and later executed.

Webster was both a medical man and a chemist. It is very difficult to understand the ignorance which should have made him think it practicable to burn a human body in anything except a specially constructed furnace, and his behaviour from beginning to end is most difficult to reconcile with the mentality which is supposed to, though it does not always, accompany academic attainments.

Chemists have not on the whole made convincing swindlers, but there have been exceptions. An Alsatian chemist born in 1840, named Paraf, was one. He was a brilliant chemical student, and after graduation he entered his father's calico works where he managed the calico printing. Travelling in Scotland and being short of money—his father had reduced his allowance on account of his extravagance—he sold a worthless dye to a Glasgow manufacturer. His qualifications and obvious knowledge of the subject no doubt helped him to make the fraud seem plausible. Paraf's life was a curious mixture of fraud and honesty, for after this venture he returned to the University of Paris and apparently carried out some research in connexion with aniline. He returned to England and there took out patents in connexion with dyes which for a time proved to be profitable. This seems to have been perfectly bona fide. Later he sailed for America on the proceeds of a stolen patent, and there succeeded in selling an aniline black for £12,000, but whether this patent was stolen or not is not clear.

Later he left New York as the result of various frauds, most of them relating to the theft of formulæ and processes, and proceeded to Chili. Here he was

engaged in some gold extraction process more or less fraudulent. This was his undoing. He was convicted of fraud and imprisoned. Paraf died in captivity some years later.

Perkin discovered mauveine in 1856, and thus instituted a chemical process which was the basis of the dye industry. Scamps are generally to be found among the vanguard of an array of discoverers, and Paraf was the villain in this case. He is perhaps among the best examples of the misuse of high scientific attainment in the service of fraud.

Few revolutionary and anarchistical organizations have been without their chemical expert. If a bomb not of the ordinary military type is to be used, a chemist is really required to give advice as to the chemicals likely to produce the most efficient kind of explosive in any given circumstances. Any detailed description of chemical explosive agents would be out of place here. It suffices to say that considerable chemical knowledge is necessary to mix the right ingredients in the right proportion. Many attempted bomb outrages have entirely failed because the infernal machines never exploded, and it is safe to say that where chemical bombs have been employed and have caused much damage, a chemical expert has almost certainly been responsible for their manufacture.

A most remarkable case occurred on the Continent a few years ago which might be described as scientific murder. Two or three deaths had taken place in mysterious circumstances which at first seemed to suggest that the victims had died natural deaths from

heart failure. Robbery had, however, been committed in each instance which suggested the possibility of foul play. A curious feature in the cases was the presence on the clothing of the victims of minute fragments of thin glass which showed a curved surface on magnification. The glass was submitted to the laboratory for examination, and it was reported that it showed appreciable traces of arsenic. The report added, however, that this probably had no significance since arsenic was a common impurity of glass.

In the latter statement the laboratory was quite correct; in the former, relating to the significance of these traces, it was, as it happened, quite wrong.

An anonymous letter and certain statements made to the police turned their inquiries in the direction of a Pole, a criminal anarchist who was known to live dishonestly, and to be engaged in revolutionary activities as well. His room was raided, and during the affray one of the policemen was killed together with the man they had come to arrest.

This Pole had originally been a professional chemist trained at one of the Universities of Central Europe. He had devised a method of filling glass bulbs with hydrogen arsenide, a very deadly gas, it was supposed under the direction of a revolutionary organization. He had found these very useful for the purpose of robbery. It was noted at the time that all the victims had been in enclosed spaces, generally motor-cars, when they were found dead. In one instance, in fact, it had been suggested that the person murdered had died of carbon monoxide poisoning from the exhaust gases of the car. The circumstances actu-

ally were that the criminal had waited about in the early hours of the morning for the well-to-do driving back to their flats from the night clubs. When the motorist stopped, one of these small bulbs was thrown into the coupé. The gas inside being under pressure burst the thin glass bulb. Dangerously toxic, it stupefied or actually killed the occupant making robbery in a deserted street a very simple matter. The possibility of detection was by this means reduced to a minimum, and in fact it was not by examination of the body or the scene of the crime that detection came about. This instrument of murder had the further advantage of allowing the criminal to escape in cases where it did not do its work. If the gas failed to kill or stupefy, the victim would have felt extremely ill and confused for perhaps five minutes, but there was left no evidence beyond insignificant fragments of glass to suggest he had been attacked. Any complaint would have been put down to passing indisposition or intoxication.

The author of these outrages was an educated man with a scientific training, a revolutionary, and a dangerous criminal. Such types hardly exist in Great Britain, and elsewhere they are fortunately rare. But it is a disquieting feature of our modern civilization that they tend to increase. In times of economic stress and crisis and at periods when employment is difficult to obtain for the educated as much as for the operative worker, the criminal ranks become swelled, and recruit a very dangerous element in law-breakers of this type. They harbour a conscious hatred of a society which cannot fit them into its

economic structure and seems indifferent to their fate. They become for this reason revolutionaries ; and they become also criminals by profession, knowing not how else to live.

The twentieth century is not the first example in history of this fact. During the second half of the eighteenth century there was a wave of crime not unlike that which we observe not without apprehension to-day, and the criminal army included a very large number of individuals originally born into the better grades of society. The economic conditions of society particularly in England so much resembled those which obtain to-day, that it is difficult to resist the conclusion that the mishandling of the economic machine by reason of the obsolete point of view of those who controlled (and control) it bears some very direct relation to an increase in the contempt for law and order.

It is not, however, the function of the detective, scientific or otherwise, to deal with the causes which lead up to crime whether in back streets or in high places, but to endeavour to control and to prevent it. The object of the observations made and the cases quoted has been rather to indicate that science, and in particular chemistry and toxicology are not by any means always on the side of law and order. In the latter part of the chapter an attempt has been made to suggest that while the "master criminal" hardly exists beyond the frontiers of popular fiction endeavours are always being made by certain types of criminal to make intelligent use of contemporary scientific knowledge. It is always impossible exactly

to measure the extent of their success since it is those who fail who must be the basis of most statistics. But unsolved crime is not so uncommon a phenomenon that we can afford to assert with any great confidence that there are not some who succeed.

The chances of their success in the future will depend very much upon the extent to which scientific organization and method are increased and improved to counter the modern problem. The educated, intelligent criminal at present still fights a losing battle with an educated and intelligent detective service, but the detective does not enjoy that priority as it were of inevitable right. A failure at any time fully to recognize the possibilities of chemistry and other branches of science in the service of crime might bring about a sudden and very disconcerting turn of tables.

CHAPTER XIV

THE CONTEMPORARY POSITION

IT is hoped that this book, if it has done nothing more, has shown conclusively that if the history of the application of science to criminal investigation is short, it is at least significant and arresting.

Among other discoveries, it is worth noting that scientific methods were applied, even if only sporadically, at an earlier period than is generally supposed. Quite apart from toxicology, investigations such as the Kirkcudbright affair and that of Hodges show that an appreciation of the value of a systematic examination of footprints and traces on the scene of the crime was not unknown even in the eighteenth and early nineteenth centuries. What was wanting was co-ordinated effort among the police at that time to apply such methods in every case.

We have observed that it was not so much lack of intelligence or even ability to apply some of the methods in use to-day, but rather a different theory as to the requirements of judicial proof which held back the development of scientific criminal investigation. Judge Cambo of Malta is a monstrously exaggerated illustration of that point of view. It would be unjust to describe it as typical. But it remains true that the onus of proving his innocence was in times past upon the accused, and that if he could

by any means be condemned out of his own mouth, it was judged legitimate to endeavour to extort admission of guilt. Scientific evidence would scarcely have been of much use to a judicial system holding this point of view ; and circumstantial evidence while it might have served to confirm would not, on its own merits, have convinced.

The point of view was changing in the early nineteenth century when we find judges beginning to insist upon the value of circumstantial evidence and its sufficiency in the matter of proof.

It will be well perhaps to make clear at this point that scientific evidence is not a specialized type of evidence. There is a sense in which all evidence, which is not perjury, is scientific since it is an instrument helping us to arrive at the truth. What we are accustomed to call scientific evidence is actually the interpretation of evidence, which might otherwise be meaningless, in the light of scientific knowledge.

This has been the matter of our survey. On the historical facts it is quite clear that there has been steady advance in this direction during the last hundred years. The requirements of judicial proof now almost always include the scientific interpretation of some of the evidence. This is the result of a steady development in scientific methods and an increasing confidence in their value as part of any forensic inquiry. On the other hand, direct evidence and particularly that supplied by the accused himself occupies a less prominent position in the administration of justice than it has done in times past.

This throws light upon a question which agitates many thinking people. A doubt is often expressed as to whether, for all our science and our improved organization, the criminal is detected with greater certainty. Statistics in this direction are very difficult to interpret, but on the whole the new methods do not appear, on the face of it, to have made much difference. It is very easy, however, to make out a *prima facie* case against the contemporary state of things, but much more difficult to justify it on more careful examination.

Scientific method in criminal investigation, as in all other things, is concerned only with the truth. It is not, or should not, be employed to convict or acquit, but merely to examine and interpret the facts. It is thus obvious that it may be responsible for revealing facts either favourable or unfavourable to the accused; it is, or it should be, absolutely unbiased. The effect of this has been increasingly to give the accused the benefit of any doubt on the one hand, while it can establish his guilt more certainly on the other. The result of this is quite clearly demonstrated in history. It was easier a hundred years ago to convict an accused person of a crime than it is now. From our survey it is quite evident that miscarriages of justice were not at all infrequent before and during the seventeenth and in the eighteenth and early nineteenth centuries. To-day, while it is sometimes suggested—and often with reason—that a guilty person has escaped, how often is it asserted that a miscarriage of justice has taken place?

This is entirely as it should be. In all civilized

countries justice requires that the guilt of an accused person shall be established beyond reasonable doubt. A strong presumption, even a moral certainty, is not sufficient if there is not evidence upon which the prisoner can be convicted. The onus of proof is upon the court or the prosecution.

It is essential here to repeat and emphasize that this is true in theory and practice of *all* civilized countries. The assertion made, even sometimes by eminent authorities in Great Britain, that on the Continent the onus of proving his innocence is upon the accused rests upon a misunderstanding. The judicial procedure of the Continent relies upon the method of inquisition, that of Great Britain upon accusation. Thus the Continent differs in practical method, but not in theory as to the onus of proof. The judge by asking questions of the accused and of witnesses endeavours to arrive at the truth, but he forms no conclusion until those questions have been asked and answered. In Great Britain the prosecution accuses, and by means of examination endeavours to establish the truth of the accusation. The defence protects the accused person from any illegitimate manipulation of the evidence to his prejudice. It is invidious to make comparisons between two methods of procedure both of which have much to be said in their favour. The statement that in England the accused is assumed to be innocent until he is proved guilty must be accepted with reserve, but where the method of accusation prevails this is, quite properly, the theoretical position of the judge and jury. Where the procedure of inquisition is followed, such a bias in the judge

would be grossly improper. If leaning in one direction or the other, he obviously cannot properly proceed by inquisition at all.

But in either method, absolutely convincing evidence is essential, and where there is doubt the accused will get the benefit of it.

The advent of scientific interpretation of evidence has emphasized this aspect of the problem. No scientific man in the absence of irrefutable proof will positively assert that such and such a proposition is true. This applies equally to molecular physics or criminal investigation. The subject of the investigation makes no difference, the principles remain. Emphasis has been laid upon this point because the fact that scientific evidence may act both ways must be clearly recognized. In a case where the evidence is meagre it may on the one hand turn the scales in favour of conviction, while on the other just that element of doubt may be introduced which secures an acquittal.

The same is true of police investigation. Additional facts introduced by the application of scientific methods may throw fresh light upon a case in favour of the suspected person. This is of great practical importance since it may prevent a prosecution which fails, and for which, therefore, the public has to pay. Improved methods of criminal investigation, in which science plays so large a part, certainly has prevented the police prosecuting on insufficient evidence. They do not frequently lose a case for the very good reason that a prosecution is not undertaken unless there are strong grounds for it.

This is evident from a consideration of such an

affair as that of Mary Ashford. Admittedly there was strong suspicion of foul play, but it is more than doubtful, had modern scientific evidence been brought to bear on the inquiry, if the Coroner's jury would have returned a true bill. This is but one instance where scientific clarification might have changed the course of events.

It is well to bear these considerations in mind when drawing conclusions from statistics relating to the detection of crime and the effect of modern methods of detection upon the number of convictions recorded.

But, on the other hand, the evidence that scientific methods make for the construction of a more convincing case where there is legitimate suspicion of guilt is overwhelming. First, to quote a negative instance, the case of Constance Kent would undoubtedly have been cleared up long before the accused confessed had scientific methods been applied to the inquiry. The recent examples quoted in this book are so numerous as to make it evident that in a number of investigations scientific evidence alone has been responsible for the conviction of the criminal, and in the remaining instances it has formed an important part of the inquiry. Here it can be claimed that there has been a definite and positive advance which the quoted examples amply confirm.

The identification of fingerprints and other skin impressions alone was a very long step forward, responsible for innumerable convictions all over the world of which no more than a tithe would have been realized had this discovery not been made. Apart from the intrinsic value of the new method of identification,

it set on foot intensive investigation in other directions which had for its object the identification of the individual from the traces he left behind. Fingerprints were the beginning of systematic research on a scientific basis. The quoted examples make it evident that this is the crux of a scientific inquiry ; the identification of a trace or an object left on the scene of a crime with a particular individual. The scientific problem is to create new and refine existing methods, which shall make this kind of identification of greater and greater practical importance.

It is also true, however, that advances in knowledge benefit the more intelligent type of criminal, but the facts on the whole go to show that the law-breaker is nearly always in a more unfavourable position than the detective. The criminal cannot well command scientific resources to the same extent as the State. It must be borne in mind, all the same, that when crime becomes organized, it can and does organize anti-detective machinery of one kind or another. The victory of the forces of detection over those of crime is not of necessity a foregone conclusion.

That is why the science of criminal investigation must not stand still. Even if there were no evidence that modern methods had reduced the number of undetected crimes, it would be sufficient to show, in justification, that the number had not increased. The modern criminal is bolder, more ingenious, and in not a few cases more intelligent than he was before the War. If methods of criminal investigation had stood still life and property would be in much greater danger than in fact they are. It is possible to go further

than this. The criminal has less chance of escape than he had twenty years ago. Waves of crime occur from time to time which seem to suggest that the law-breaker is gaining ground, but a thorough examination of statistics over any representative period of time disproves the pessimistic forebodings of those who seem to think that the modern criminal is proving, or will prove, one too many for the police.

It is hoped that the evidence advanced in this book has revealed the great debt which criminal investigation owes to modern science. Chemistry, physics, mathematics, and biology in their specialized application for many years, as we have seen, have been used in the service of the detection of crime. Criminal detection has shared the increase in efficiency which these sciences have brought to civilization whose aim it is to combat the criminal problem by the speedy detection of the wrongdoer and the use of methods, when he is detected, that shall ensure as far as possible that the community is protected against its enemies.

The prevention of crime—the fear of inevitable detection itself acts as a preventative—is outside the scope of this book. But it is well to remind the reader that the ultimate and most worthy object is the prevention of the social disease of crime which it is better, as with other diseases, to endeavour to prevent rather than to cure.

In this regard science has done a great deal and will do a great deal more. This aspect of the question is of indirect but of great interest to the detective. The police have to, and do, co-operate in pre-

venting crime. The extent to which the police in this country recognize this, as evidenced by the great humanity which they deal with difficult cases, is a fact of which they have every right to be proud. A knowledge and study not only of scientific means of detection, but as to the reasons why crime is committed, and a common-sense application of psychological principles in the observation of crime and the circumstances which lead up to it are as valuable to a modern detective force as a knowledge of fingerprints or toxicology.

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